



LASER PRINTER SERVICE MANUAL

MODEL:HL-760



MECHANISMS & ELECTRONICS

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PREFACE

This service manual contains basic information required for after-sales service of the laser printer (here-in-after referred to as "this machine" or "the printer"). This information is vital to the service technical in maintaining the high printing quality and performance of the printer.

This service manual covers HL-760.

This manual consists of the following chapters:

CHAPTER I : FEATURES AND SPECIFICATIONS

Features, specifications, etc.

CHAPTER II : THEORY OF OPERATION

Basic operation of the mechanical system, the electrical system and the electrical circuit, and their timing.

CHAPTER III : DISASSEMBLY AND REASSEMBLY

Procedures of disassembling and reassembling the mechanical system.

CHAPTER IV : TROUBLESHOOTING

Reference values and adjustment, troubleshooting for image defects, troubleshooting for malfunctions, etc.

APPENDICES : Connection diagrams, PCB circuit diagrams.

Note: This service manual of HL-760 describes only different parts from the each part of the HL-720/730 (84U002BE0) service manual which was published before. We omit the same parts with that of HL-720/730 and describe the effect of it in contents. When you find the omitted parts, please refer to the service manual of that model.

Information in this manual is subject to change due to improvement or re-design of the product. All relevant information in such cases will be supplied in service information bulletins (Technical Information).

A thorough understanding of this printer, based on information in this service manual and service information bulletins, is required for maintaining its quality performance and for fostering the practical ability to find the cause of troubles.

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CHAPTER I FEATURES AND SPECIFICATIONS

1. FEATURES

This printer has the following features:

1200 dpi Resolution and 6 ppm Printing Speed

1200 dots per inch (dpi) with microfine toner and six pages per minute (ppm) printing speed (A4 or Letter size paper).

User-Friendly Operation for Windows

The dedicated printer driver and TrueType™-compatible fonts for Microsoft® Windows 3.1 and Windows 95 are available on the floppy disk supplied with your printer. You can easily install them into your Windows system using our installer program. The driver supports our unique compression mode to enhance printing speed in Windows applications and allows you to set various printer settings including toner saving mode, custom paper size, sleep mode, gray scale adjustment, resolution, and so forth. You can easily setup these print options in the graphic dialog boxes through Printer Setup within Windows Control Panel.

Printer Status Monitor with Bi-directional Parallel Interface

The printer driver can monitor your printer's status using bi-directional parallel communications.

The printer status monitor program can show the current status of your printer. When printing, the animated dialog box appears on your computer screen to show the current printing process. If an error occurs, a dialog box will appear to let you know what to correct. For example: when your printer is out of paper, the dialog box will display "Paper Empty" and instructions for corrective action to take.

Versatile Paper Handling

The printer has a multi-purpose sheet feeder and straight paper path mechanism. Using this mechanism, you can load A4, letter, legal, B5, A5, and executive sizes of paper, and various types of paper including envelopes, postcards, organizer paper, or a custom paper size. The multi-purpose sheet feeder also allows manual paper loading, so you can also use labels and transparencies.

Environment-Friendly, Economy Printing Mode

This feature will cut your printing cost by saving toner. It is useful to obtain draft copies for proof-reading. You can select from two economy modes 25% toner saving and 50% toner saving, through the Windows printer driver supplied with your printer.

Sleep Mode (Power Save Mode)

Sleep mode automatically reduces power consumption when the printer is not in use. The printer consumes less than 10W when in sleep mode.

Low Running Cost

The toner cartridge is separate from the drum unit. You need to replace only the toner cartridge after around 2,000 pages, which is cost effective and ecologically friendly. (In some areas the printer is supplied with a starter toner cartridge which must be replaced after 1,000 pages.)

Remote Printer Console Program for DOS

The utility program, Remote Printer Console (RPC), is available on the floppy disk supplied with your printer. When you operate your computer in the DOS (Disk Operating System) environment, this program allows you to easily change the default settings of the printer such as fonts, page setup, emulations and so on.

This program also provides a status monitor program, which is a Terminate-and-Stay Resident (TSR) program. It can monitor the printer status while running in the background and report the current status or errors on your computer screen.

Popular Printer Emulation Support

This printer supports three printer emulation modes, HP LaserJet 5P, Epson FX-850, and IBM Proprinter XL. The printer also supports Auto-emulation switching between HP and Epson or HP and IBM. If you want to set the printer emulation, you can do it using the Remote Printer Console Program.

Optional Apple Macintosh Interface

The optional Apple Macintosh serial interface kit is available, which allows your printer to be connected to Apple Macintosh computers. With this option, you can use your printer with both an IBM PC, or compatible and an Apple Macintosh at the same time. This optional interface board can be used as an RS-422A interface for Macintosh or an RS-232C serial interface for IBM PC or compatible.

Enhanced Memory Management

The printer provides its own data compression technology on its printer hardware and the supplied printer driver software, which can automatically compress graphic data and font data efficiently into the printer's memory. You can avoid memory errors and print most full page 600 dpi graphic and text data, including large fonts, with the printer's standard memory.

2. SPECIFICATIONS

2.1 Printing

Print method	Electrophotography by semiconductor laser beam scanning
Resolution	1200 dots/inch
Print speed	6 page/minute (when loading Letter-size paper from the multi-purpose sheet feeder)
Warm-up	Max. 30 seconds at 23°C (73.4°F)
First print	20 seconds (when loading Letter-size paper from the multi-purpose sheet feeder)
Print media	Toner in a cartridge Life Expectancy: 2,200 pages/cartridge (when printing A4 or letter -size paper at 5% print coverage)
Developer	Drum unit, separated from toner cartridge

2.2 Functions

CPU	IDT79R3041-20J 20MHz
Emulation	Automatic emulation selection among HP LaserJet 5P, EPSON FX-850, and IBM Proprinter XL
Printer driver	Windows 95/Windows 3.1 driver, supporting Brother Native Compression mode and bi-directional capability. Optional Macintosh® QuickDraw driver (Standard in some countries.)
Interface	Bi-directional Centronics parallel interface. RS-422A/RS-232C serial interface is optionally available. (The serial interface is a standard in some countries.)
Memory	1.0 Mbytes with Data Compression Technology. Expandable up to 33 Mbytes with the SIMM.
Control panel	1 switch and 4 lamps
Diagnostics	Self-diagnostic program

2.3 Electrical and Mechanical

Power source	U.S.A. and Canada: AC 110 to 120 V, 60Hz Europe and Australia: AC 220 to 240 V, 50Hz
Power consumption	Printing: 480 W or less Standing by: 60 W or less Sleep: 10 W or less
Noise	Printing: 50 dB A or less Standing by: 38 dB A or less
Temperature	Operating: 10 to 32.5°C (59 to 90.5°F) Storage: 0 to 40° C (38 to 104°F)
Humidity	Operating: 20 to 80% (without condensation) Storage: 20 to 80% (without condensation)
Dimensions (W x D x H)	366 (W) x 377 (D) x 250 (H) (when the output tray is closed and the Multi-purpose sheet feeder is removed.)
Weight	Approx. 7.0 kg (15.45 lb.)

CHAPTER II THEORY OF OPERATION

1. ELECTRONICS

1.1 General Block Diagram

Fig. 2.1 shows a general block diagram of this printer.

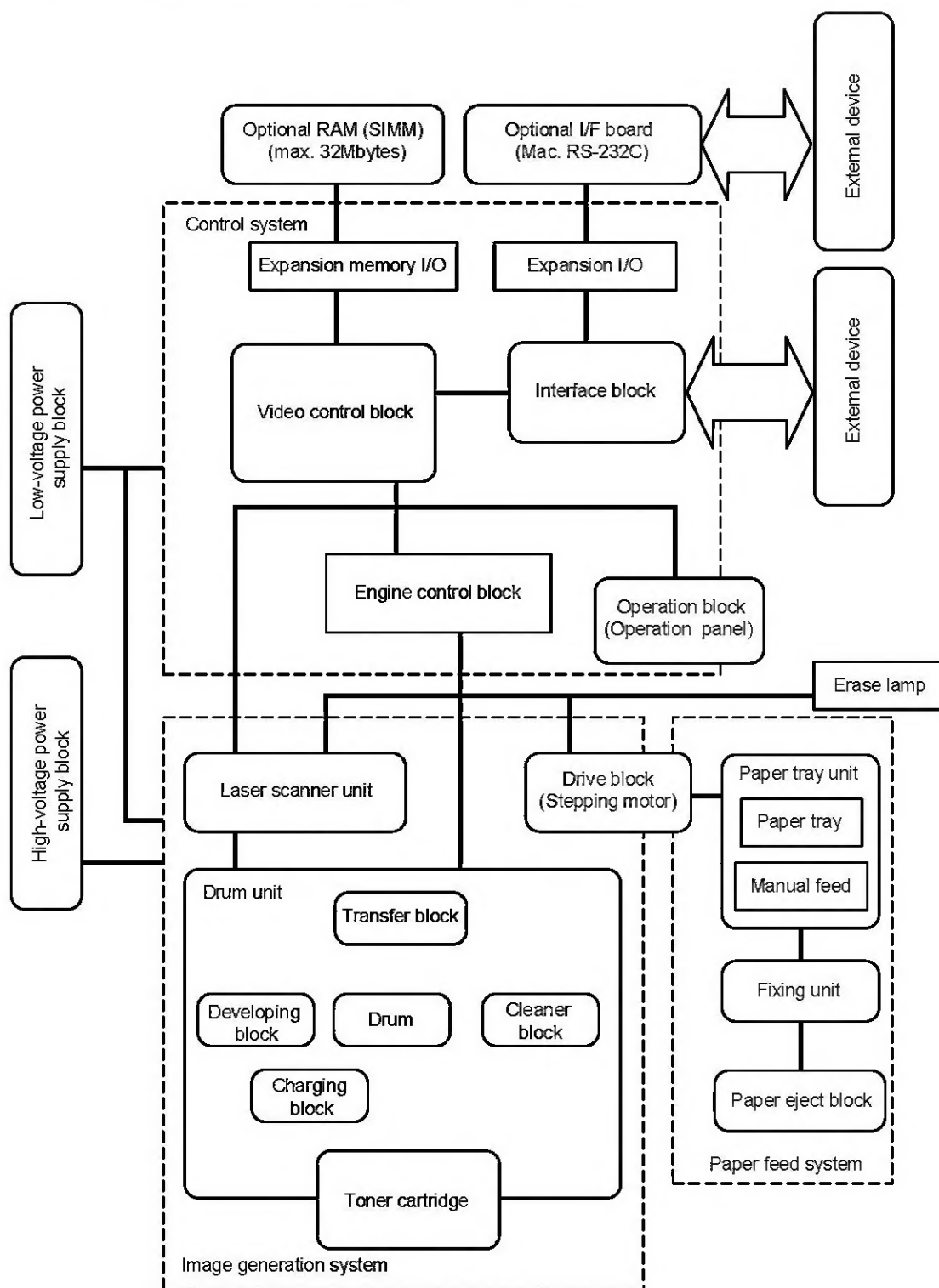


Fig. 2.1

1.2 Main PCB Block Diagram

Fig. 2.2 shows a block diagram of the main PCB.

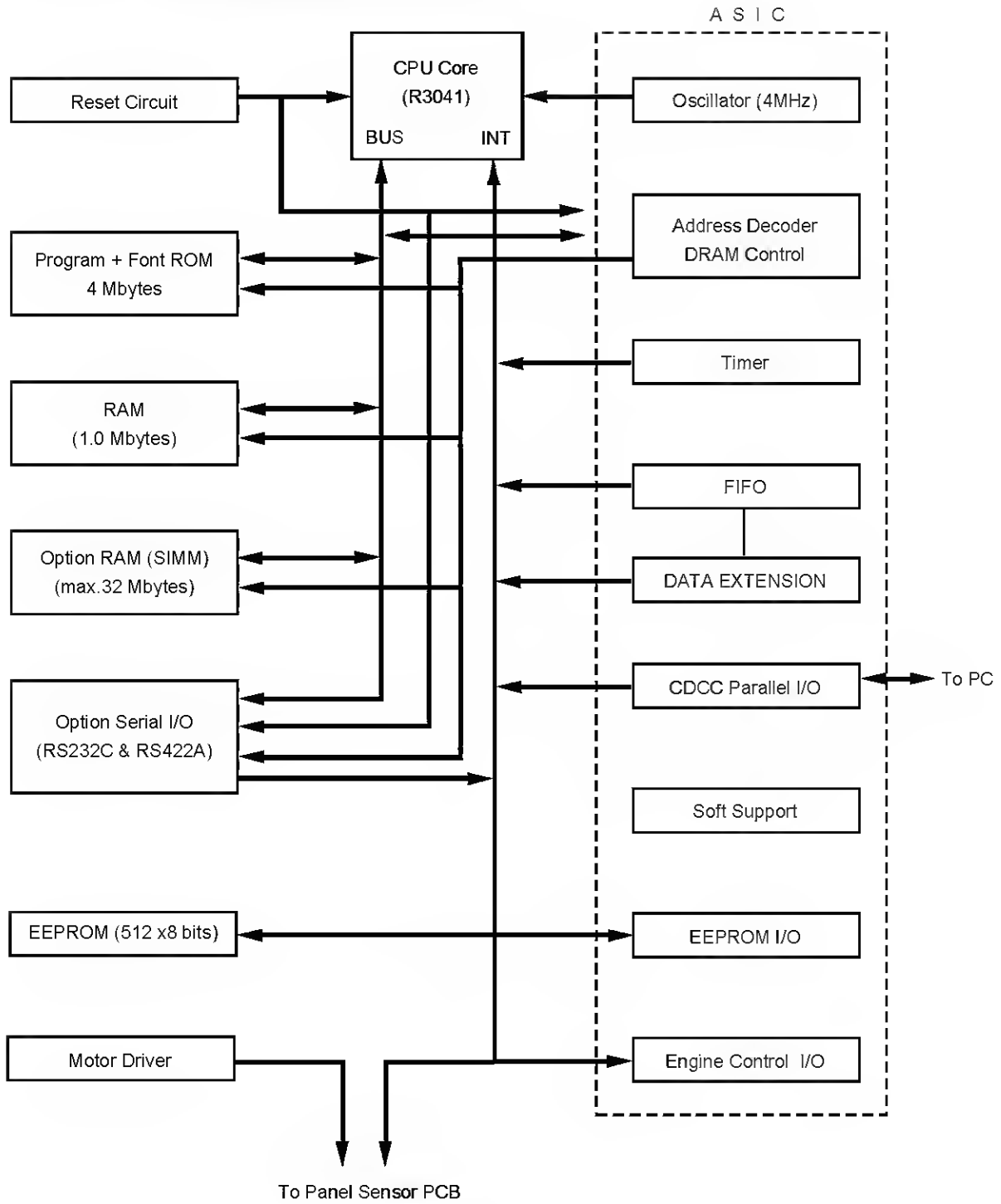


Fig. 2.2

1.3 Main PCB

1.3.1 CPU Core

Fig. 2.3. shows the CPU circuit block on the main PCB.

The CPU is a IDT 79R3041-20J which is driven with a clock frequency of 20 MHz. This clock frequency is made by dividing the source clock of 40.0 MHz into two. The address and data bus are 32 bits of AD0 to AD31. The total memory space is 4 Gbytes.

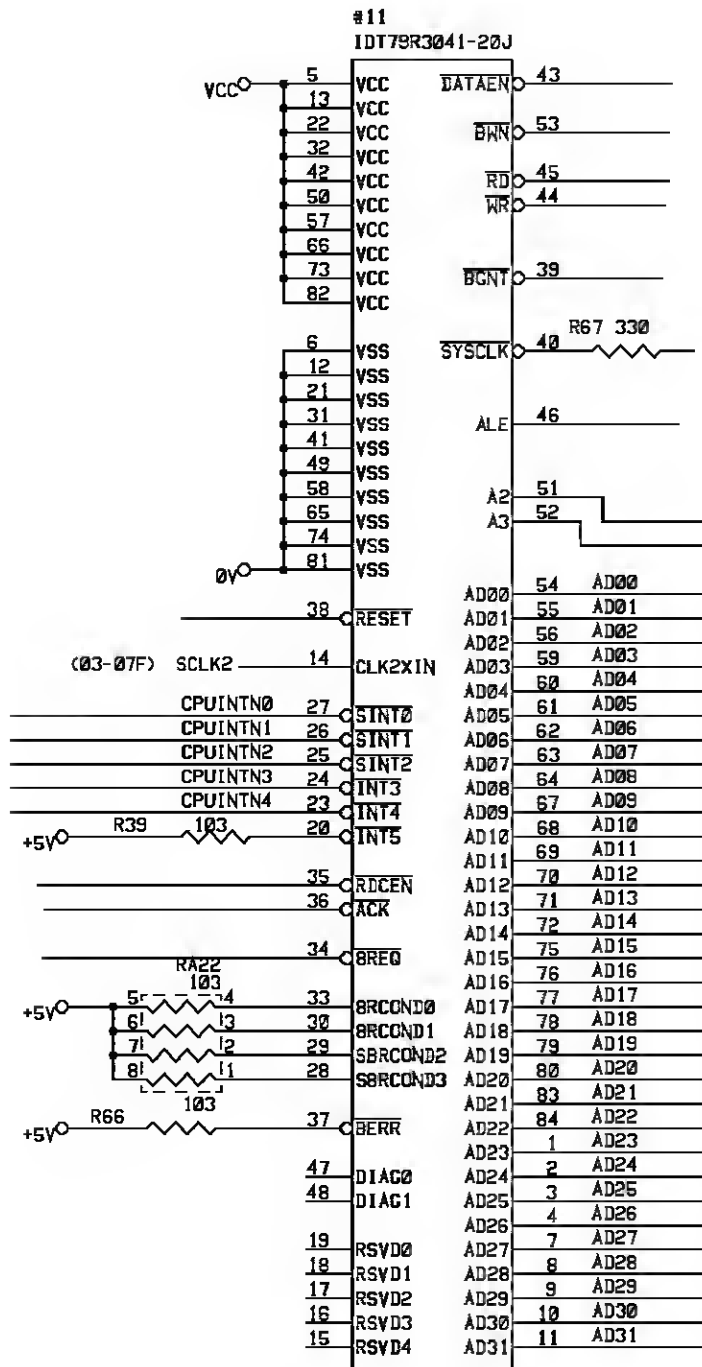


Fig. 2.3

1.3.2 ASIC

The ASIC is composed of Cell Based IC and has the following function blocks.

(1) Oscillator circuit

Generates the main clock for the CPU by dividing the source clock frequency into two.

(2) Address Generator

It forms address bus by ratchetting the AD bus with the ALE signal.

(3) Address decoder

Generates the CS for each device.

(4) DRAM control

Generates the $\overline{\text{RAS}}$, $\overline{\text{CAS}}$, $\overline{\text{WE}}$, $\overline{\text{OE}}$ and MA signals for the DRAM and controls refresh processing (CAS before RAS self-refreshing method).

(5) Interrupt control

Interrupt levels:

Priority	High	9	TIMER 3 (Watch Dog)
		8	MONITOR
		7	FIFO
		6	EXINT
		5	TIMER1
		4	BD
		3	Spare
		2	CDCC / BOISE / DATA EXTENTION
	Low	1	TIMER 2

All of the breaking can mask.

(6) Timers

The following timers are incorporated:

Timer 1	16-bit timer
Timer 2	10-bit timer
Timer 3	Watch-dog timer

(7) FIFO

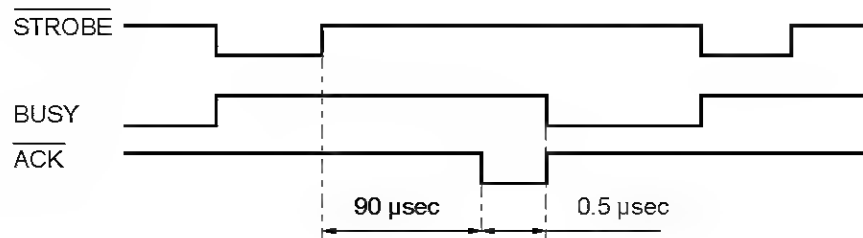
A 10kbit FIFO is incorporated. Data for one raster is transfered from the RAM to the FIFO by DMA transmission and is output as serial video data. The data cycle is 6.13 MHz.

(8) CDCC parallel I/O

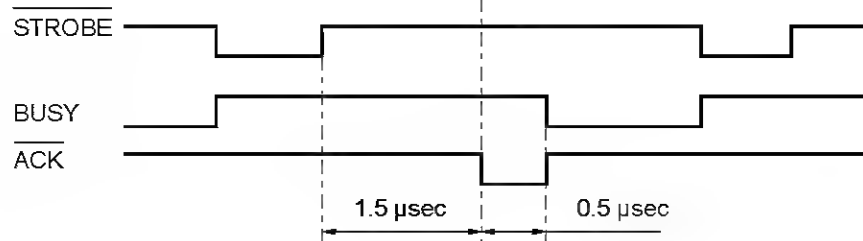
<Data receiving>

There are two modes in this unit. One is the CPU receiving mode and the other is the DMA receiving mode. In the CPU receiving mode the CPU receives the command data from the PC, and after the CPU is switched to the DMA mode, it receives the image data and writes to the DRAM directly.

CPU Receiving Mode



DMA Receiving Mode



BUSY goes HIGH at the falling edge of STROBE. The data (8 bits) from the PC is latched in the data buffer at the rising edge of STROBE. The pulse width of ACK differs according to the speed MODE as shown above. BUSY goes LOW at the rising edge of ACK.

<IEEE1284 support>

This supports the IEEE1284 data transfer with the following mode.

Nibble	mode
Byte	mode
ECP	mode

(9) Data extension

This circuit extends the compressed image data which are received from the PC, and writes the bit map data to the FIFO.

(10) Software support

Supports 16 x 16 rotation, bit expansion, bit search, and decimal point change.

(11) EEPROM I/O

One output port and one I/O port are assigned.

(12) Engine control I/O

This I/O is used for the connection to the panel sensor PCB. It controls the main motor, solenoid, sensors, etc.

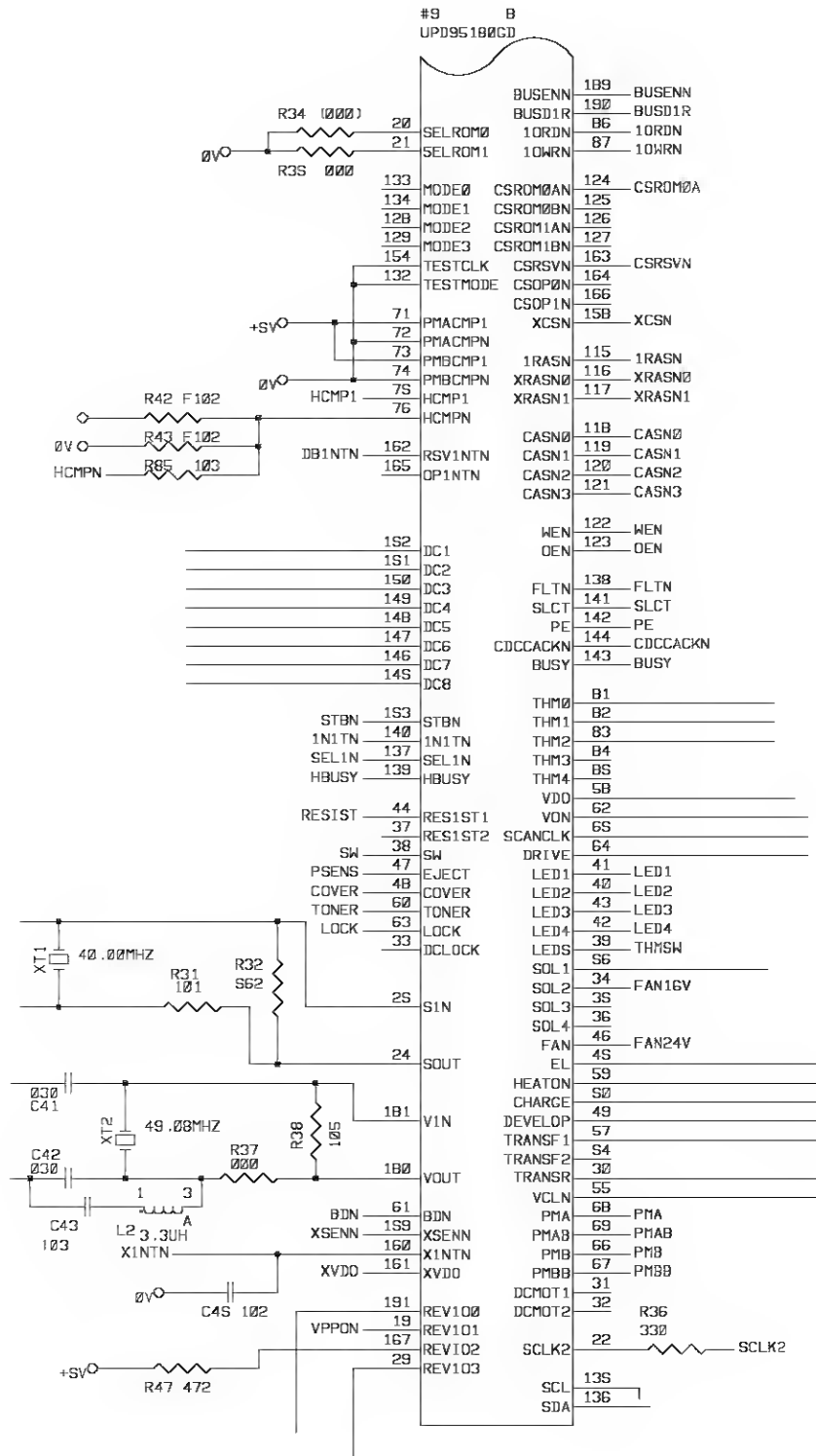


Fig. 2.4

1.3.3 ROM

A program and font data are stored in the 4MBytes ROM. ROM is composed by the two 16 Mbits masks and is mounted to the 42 pin IC socket. And 16 Mbits Flash ROM Module can be mounted to it, too.

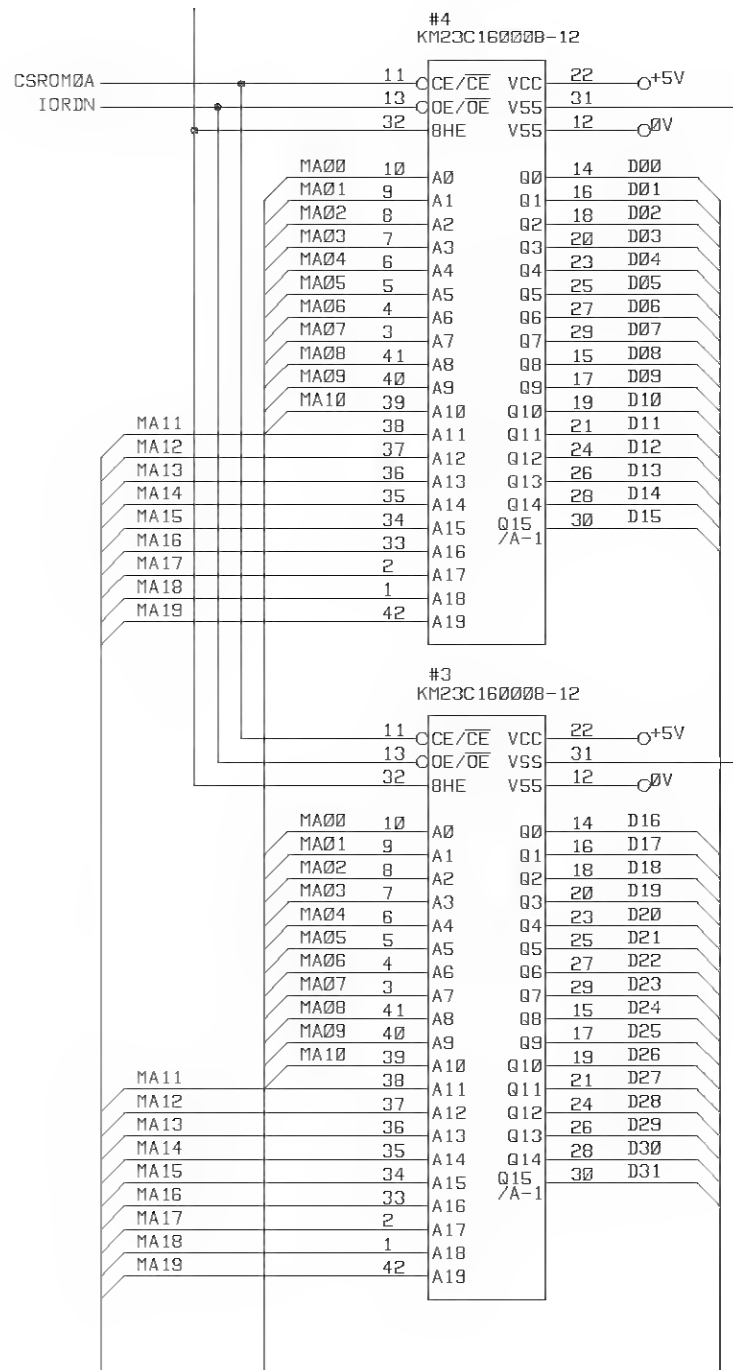


Fig. 2.5

1.3.4 DRAM

Two 4M-bit DRAMs (x 16bits) are used as the RAM.

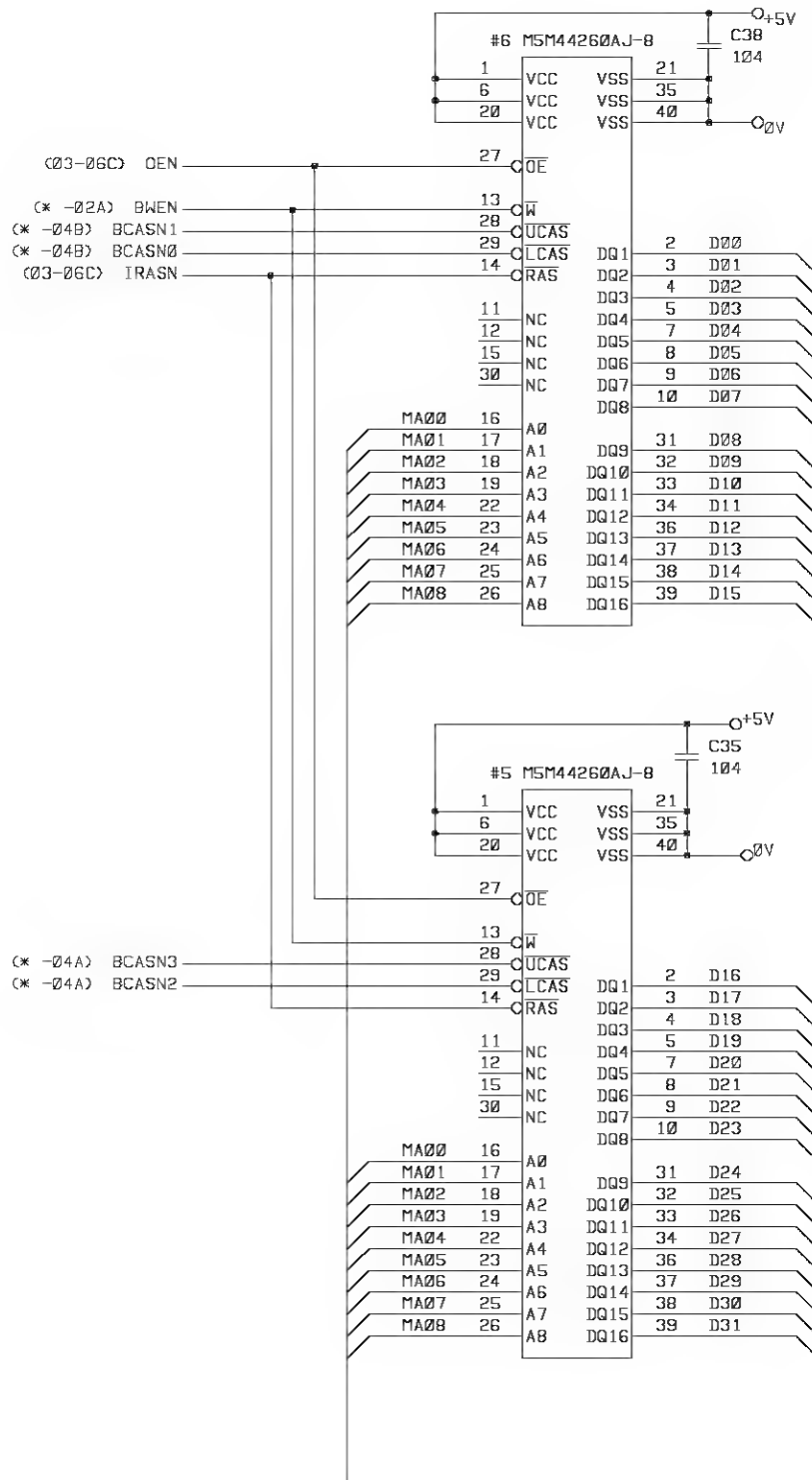


Fig. 2.6

1.3.5 Optional RAM

As the option RAM, 32 bit SIMM of 72 pin can be mounted. SIMM has one slot and can deal with 1 MBytes to 32 MBytes.

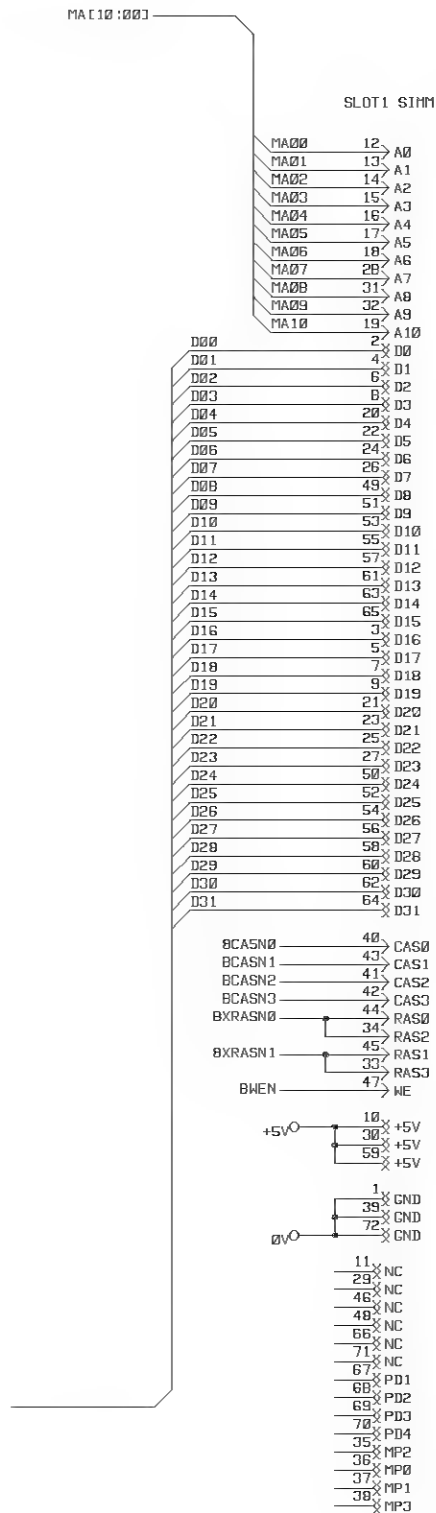


Fig. 2.7

1.3.6 Optional Serial I/O

The interrupt of serial I/O are input to the EXINT terminal of the ASIC, and are recognized by the CPU. A 32-byte space for register is provided for this I/O, which are read and written to by the CPU.

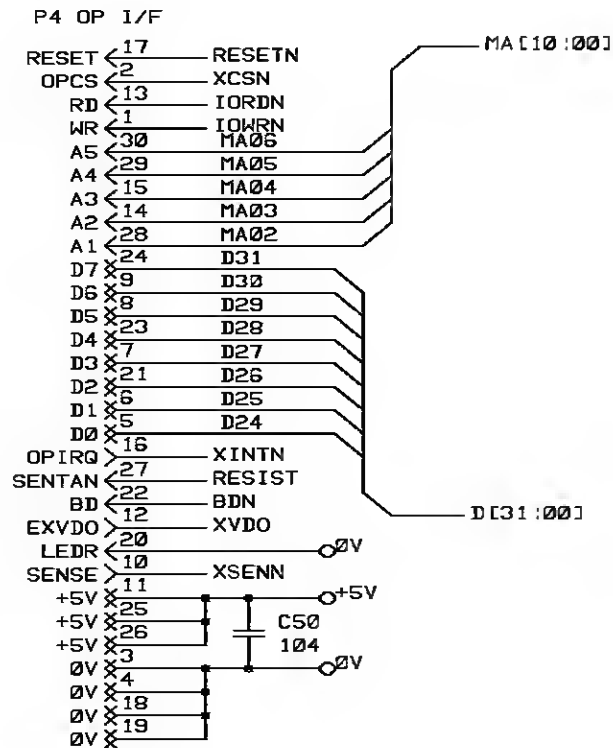


Fig. 2.8

1.3.7 EEPROM

The EEPROM is X24C04F type of a two-wire method with a 512 x 8 bits configuration.

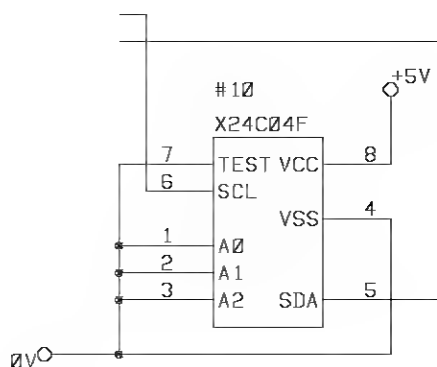


Fig. 2.9

1.3.8 Reset Circuit

The reset IC is PST591DMT. The reset voltage is 4.2V (typ.) and the LOW period of reset is 50 ms (typ).

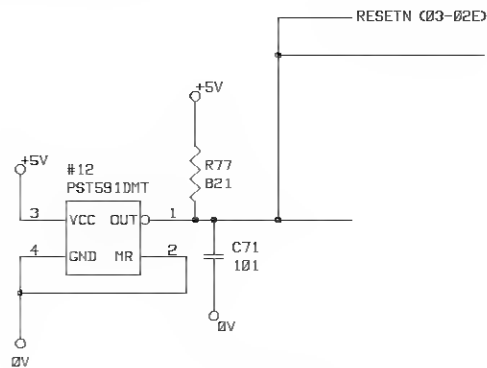


Fig. 2.10

1.3.9 CDCC I/O

Fig. 2.11 shows the CDCC interface circuit.

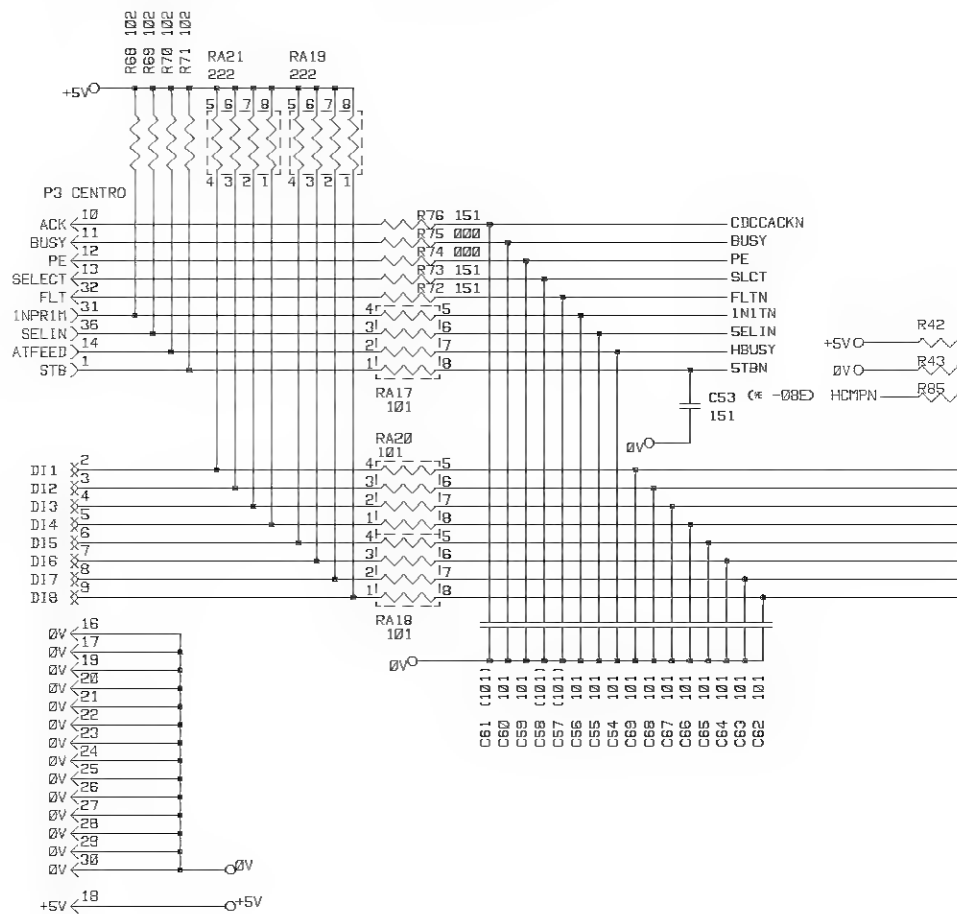


Fig. 2.11

1.3.10 Engine I/O

Fig. 2.12 shows the engine interface circuit.

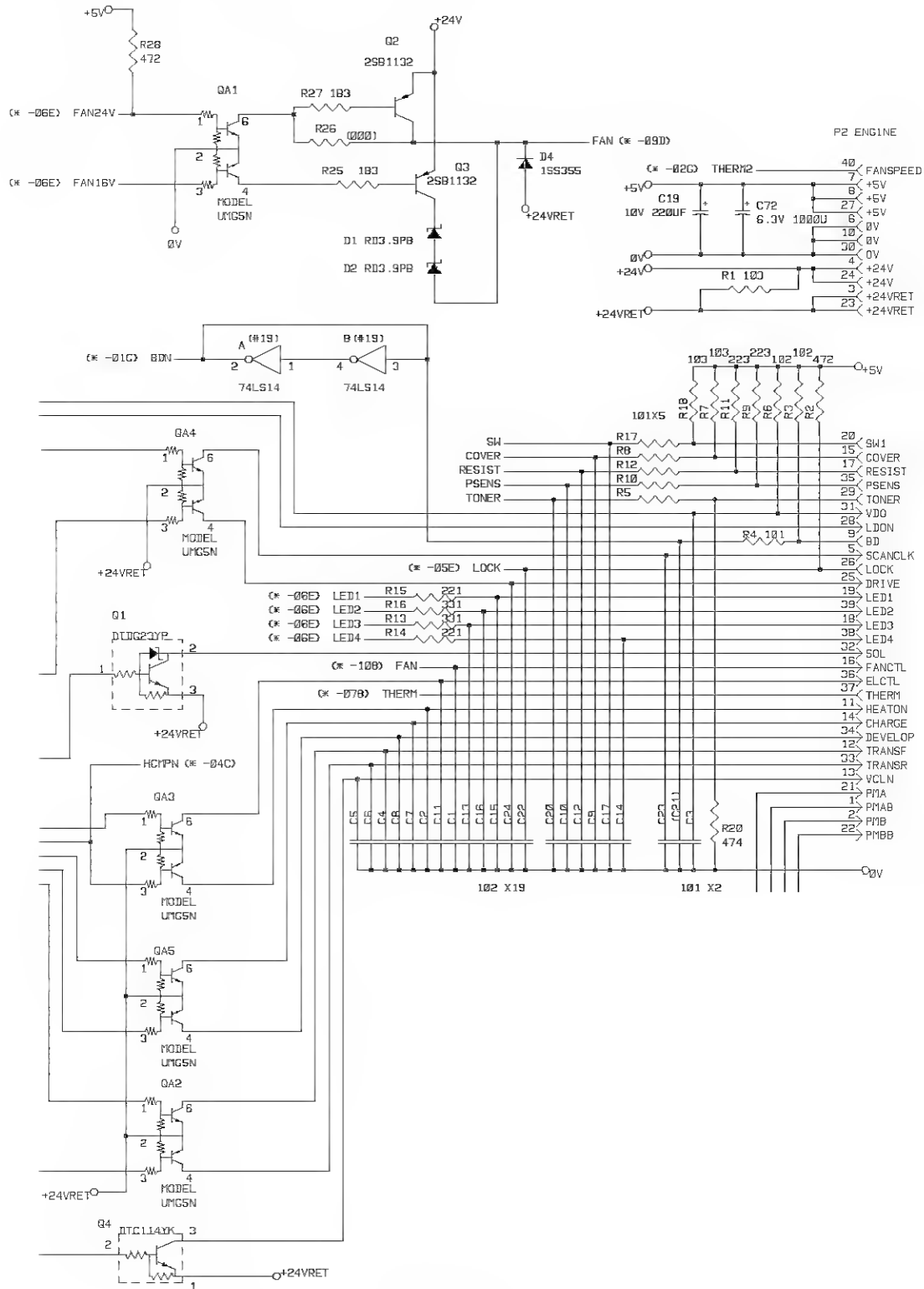


Fig. 2.12

1.3.11 Paper Feed Motor Drive Circuit

The motor driver is a TR array, The excitation method is 2-2 phase excitation with an bipolar drive.

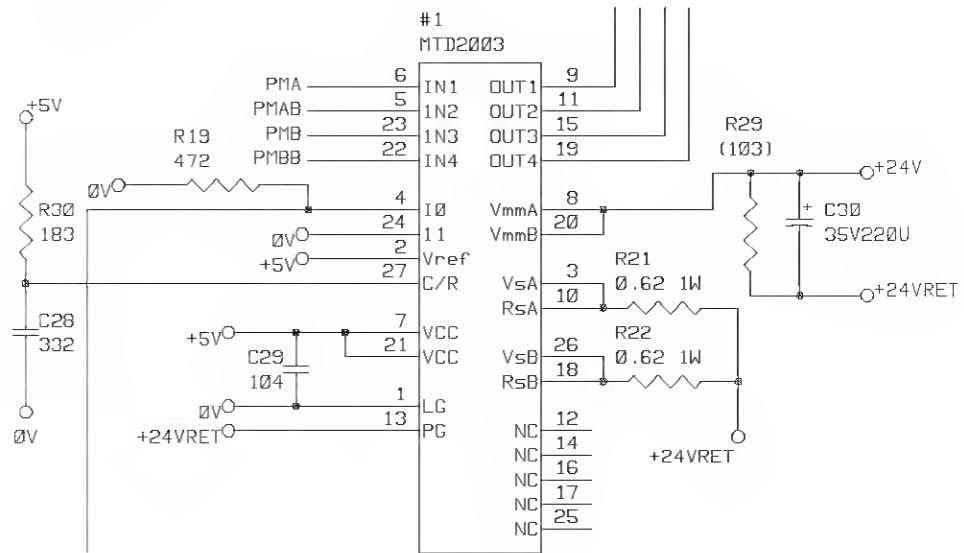


Fig. 2.13

CHAPTER III DISASSEMBLY AND REASSEMBLY

1. SAFETY PRECAUTIONS

To prevent the creation of secondary problems by mishandling, be careful about the following precautions during maintenance work.

- (1) Always turn off the power switch before replacing parts or units. When accessing the power supply PCB or components, be sure to unplug the power cord from the power outlet.
- (2) Be careful not to lose screws, washers, or other parts removed.
- (3) Be sure to apply grease to the gears and applicable positions specified in this chapter.
- (4) When using soldering irons or other heat-generating tools, take care not to damage the resin parts such as wires, PCBs, and covers.
- (5) Before handling the PCBs, touch a metal portion of the equipment to discharge the static electricity charged in your body, or the electronic parts or components may be damaged.
- (6) When transporting PCBs, be sure to wrap them in conductive sheet such as aluminum foil.
- (7) Be sure to replace self-tapping screws correctly, if removed. Unless otherwise specified, tighten screws to the following torque values.

TAPTITE, BIND or CUP B

M3 : 6kgf • cm

M4 : 9kgf • cm

TAPTITE, BIND S

M3 : 9kgf • cm

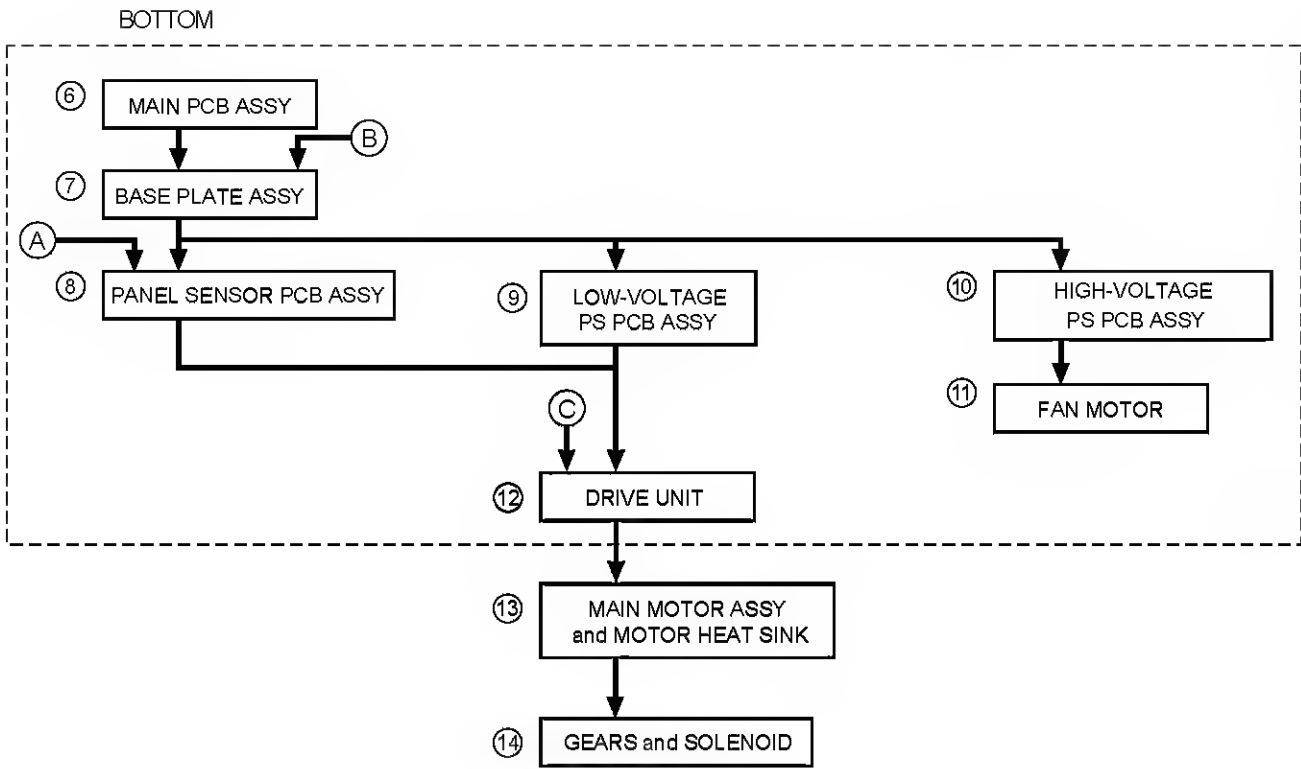
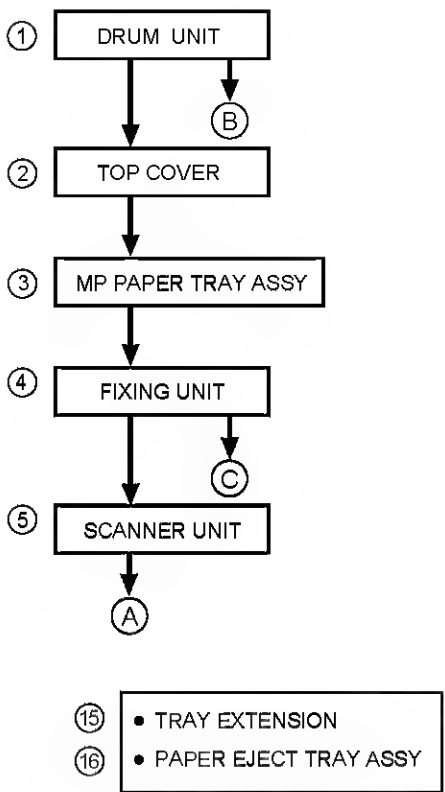
SCREW

M3 : 7kgf • cm

M4 : 10kgf • cm

- (8) When connecting or disconnecting cable connectors, hold the connector bodies, but not the cables. If the connector has a lock, release the connector lock first to unlock it.
- (9) After a repair, check not only the repaired portion but also the connectors, or check if other related portions are functioning properly before doing operation checks.

2. DISASSEMBLING FLOW



3. DISASSEMBLING PROCEDURE

3.1 Drum Unit

- (1) Open the top cover.
- (2) Lift out the drum unit.

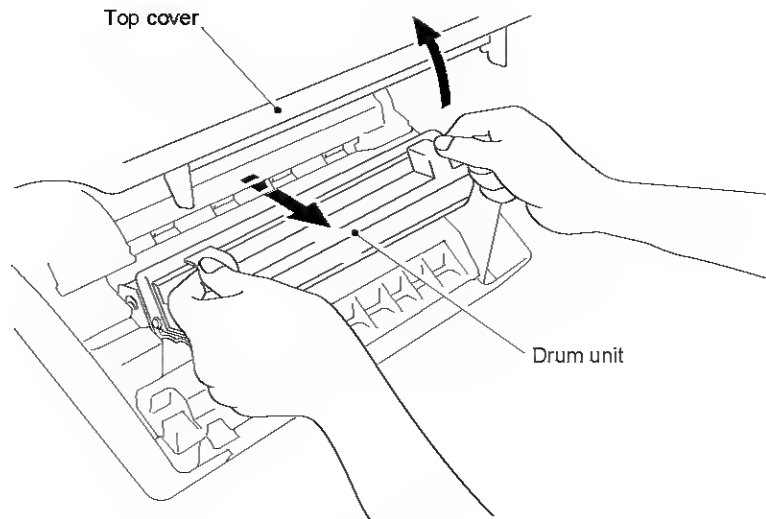


Fig. 3.1

3.2 Top Cover

- (1) Open the top cover to the first lock position.
- (2) Prize up the top cover link and free it from the dowel on the top cover to release it inward.
- (3) Press the link downward.

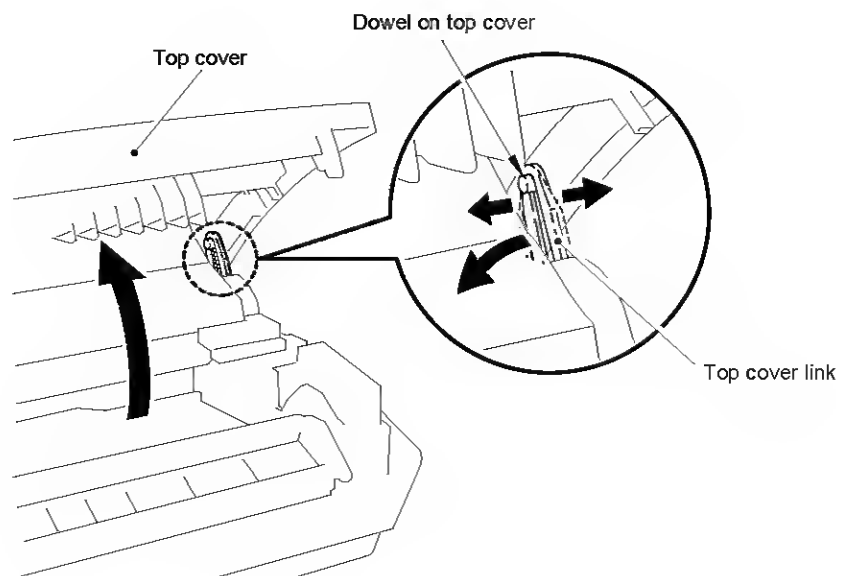


Fig. 3.2

- (4) Open the top cover further, release the catch of the both side by sliding the top cover backward.

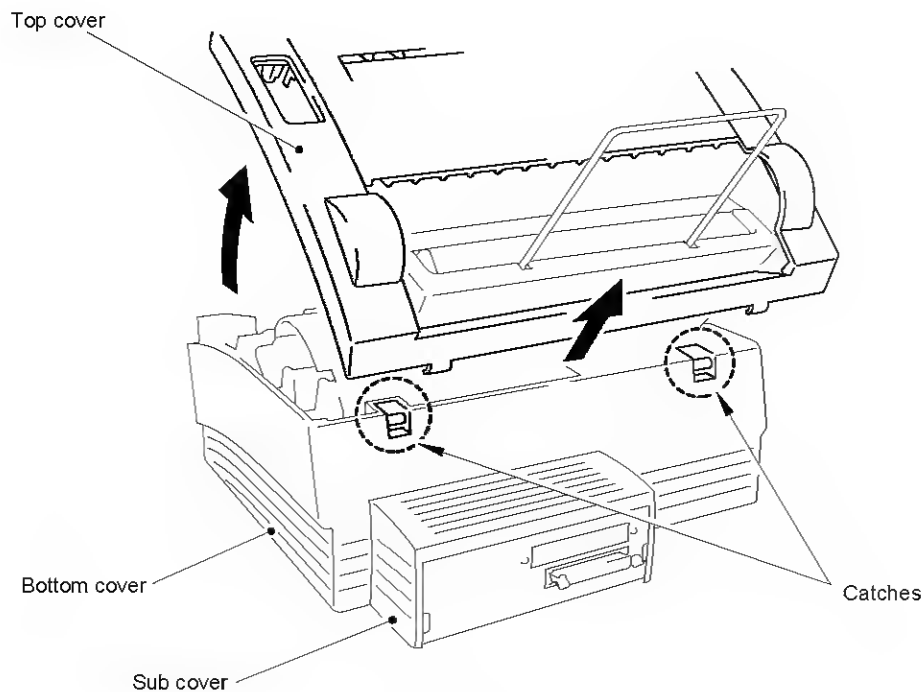
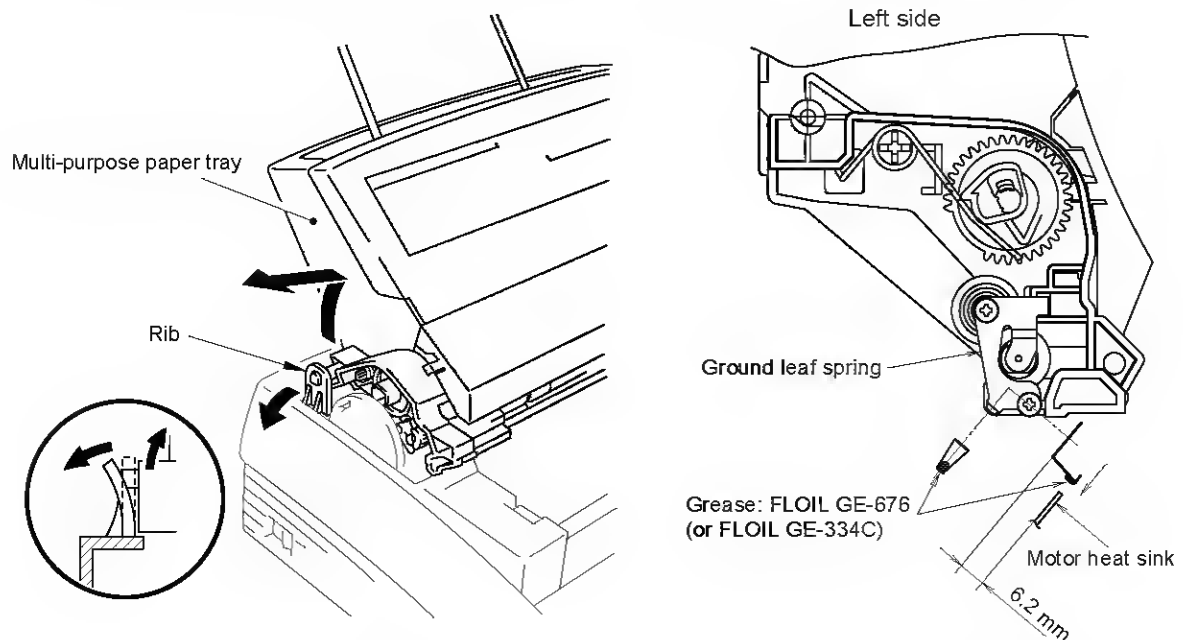


Fig. 3.3

3.3 Multi-purpose Paper Tray Assy

- (1) Tilt the left outward and pull out the MP tray. It is not necessary to tilt the right rib.



NOTE: When reassembling, apply a suitable amount of grease (2 rice-grain size) between the heat sink of the motor and the ground leaf spring in case of grease shortage.

Fig. 3.4

3.4 Fixing Unit

- (1) Remove the screw securing the fixing unit.
- (2) Lifting up the fixing unit, disconnect the two heater harnesses and remove the connector of thermistor on EL PCB.

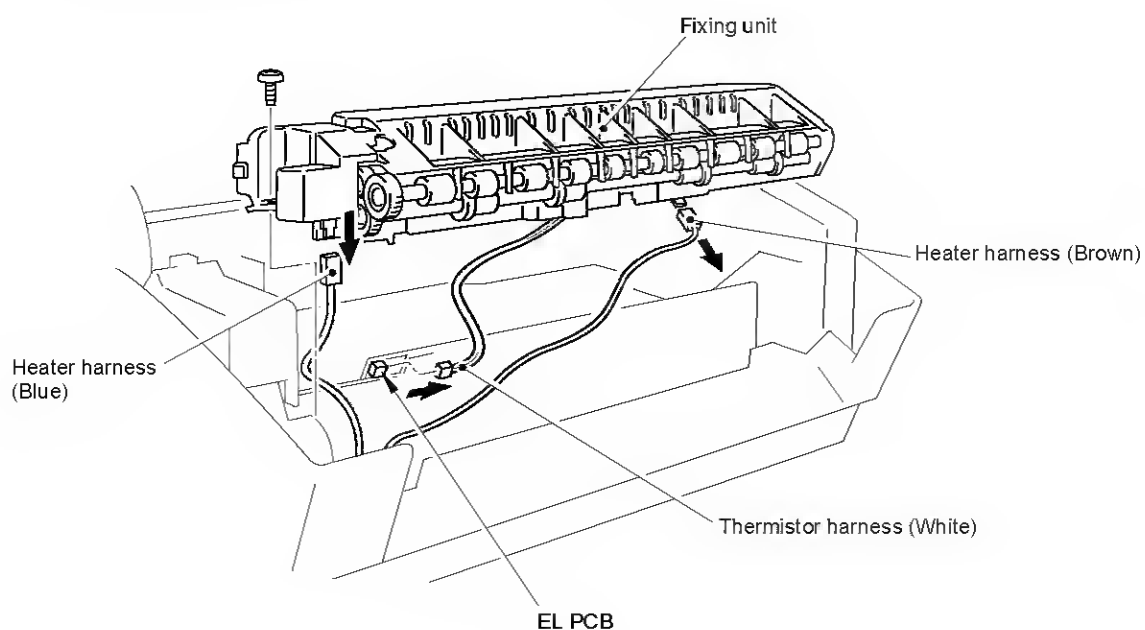


Fig. 3.5

3.5 Scanner Unit

- (1) Remove the three screws.
- (2) Lift out the scanner unit.
- (3) Disconnect the three connectors of the scanner unit from the panel sensor PCB.
- (4) Remove the screw and disassemble the Toner sensor PCB from the Scanner unit.

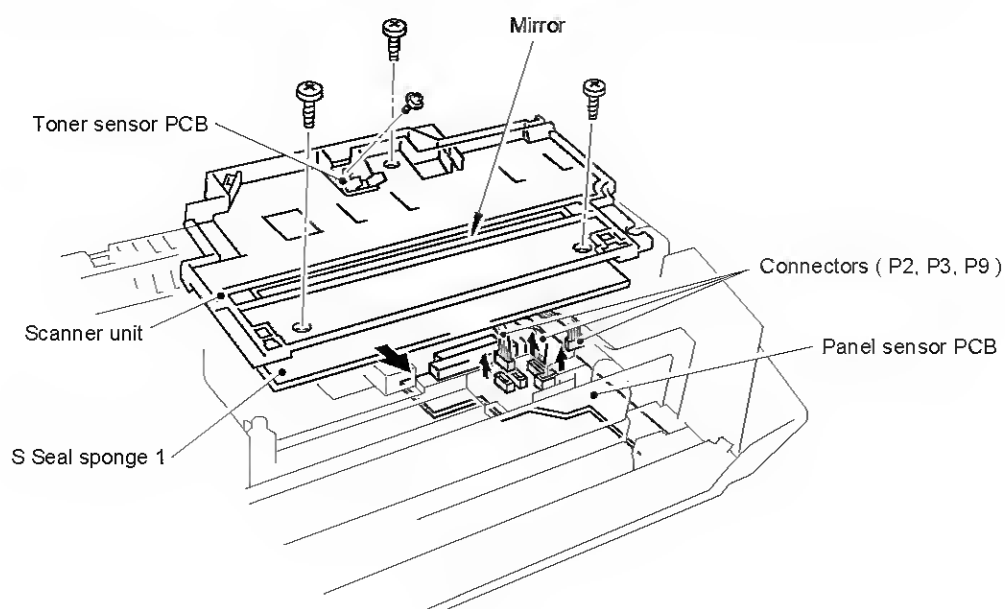


Fig. 3.6

NOTE: Never touch the inside of the scanner unit or the mirror when disassembling or reassembling. If there is any garbage or dust on the mirror, blow it off.

3.6 Main PCB Assy

- (1) Remove four screws securing the main PCB holder on the back side of the printer.
- (2) Grasp the hooks at left and right and draw out the main PCB assy.

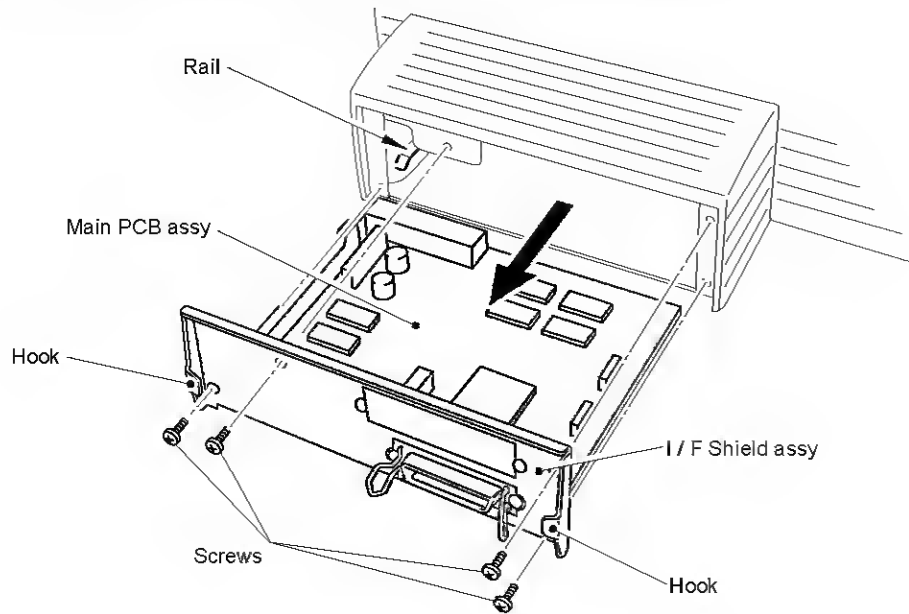


Fig. 3.7

3.7 Base Plate Assy

NOTE: Prior to turning the printer upside-down, drum unit should be removed from the printer.

- (1) Turn the printer upside down.
- (2) Remove the six M4 and eight M3 tapping screws.
- (3) Lift out the base plate assy and remove the grounding screw.

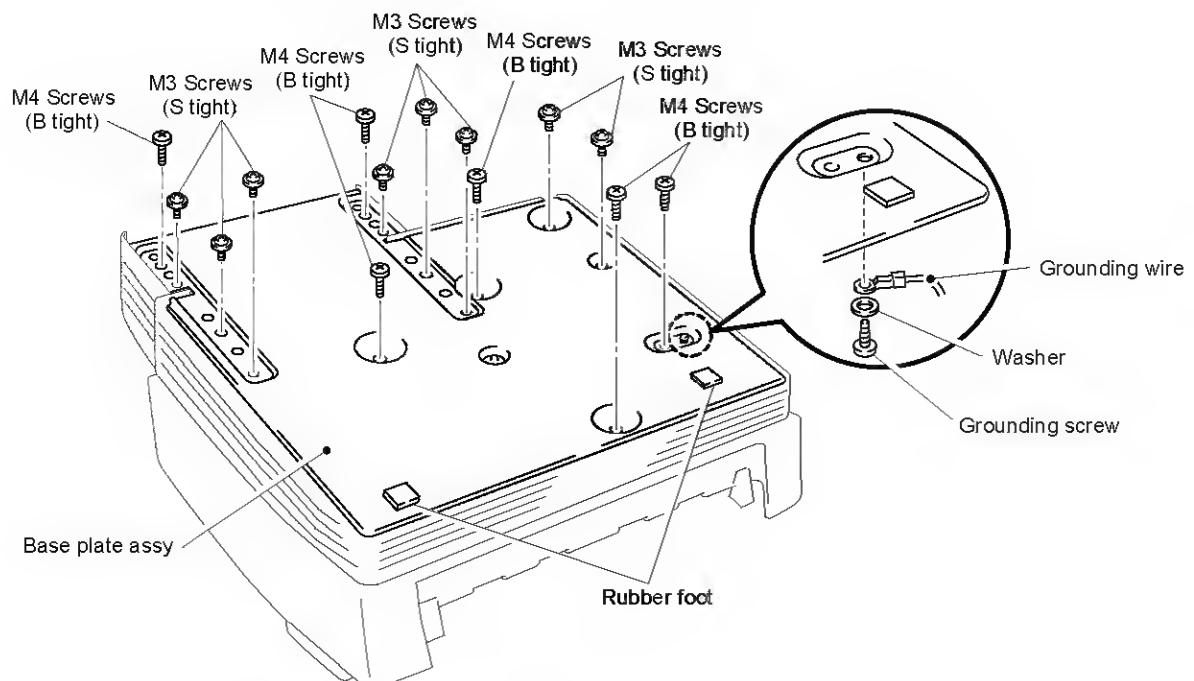


Fig. 3.8

3.8 Panel sensor PCB Assy

- (1) Remove the screw securing the panel sensor PCB assy. (Remove the part A from under the main shield)
- (2) Disconnect the seven connectors from the PCB (The three connectors have already disconnected at the disassembling scanner unit. See page, III-5).

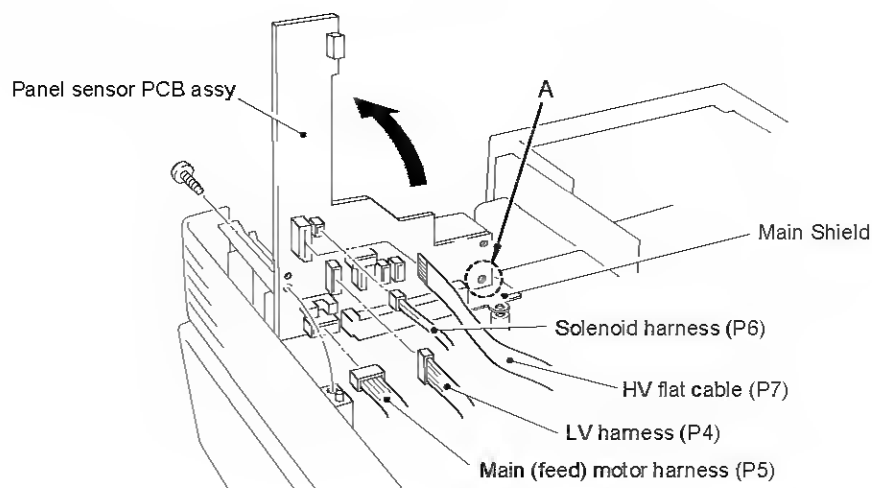


Fig. 3.9

NOTE1: When reassembling, the connectors must be inserted to the PCB without floating and the PCB must not be floated by the harnesses.

NOTE2: The connector should be inserted by fitting the housing color and the pin number.

3.9 Low-Voltage Power Supply PCB Assy

- (1) Remove the screw securing the low-voltage power supply PCB assy.
- (2) Disconnect the two connectors from the component side of the PCB.

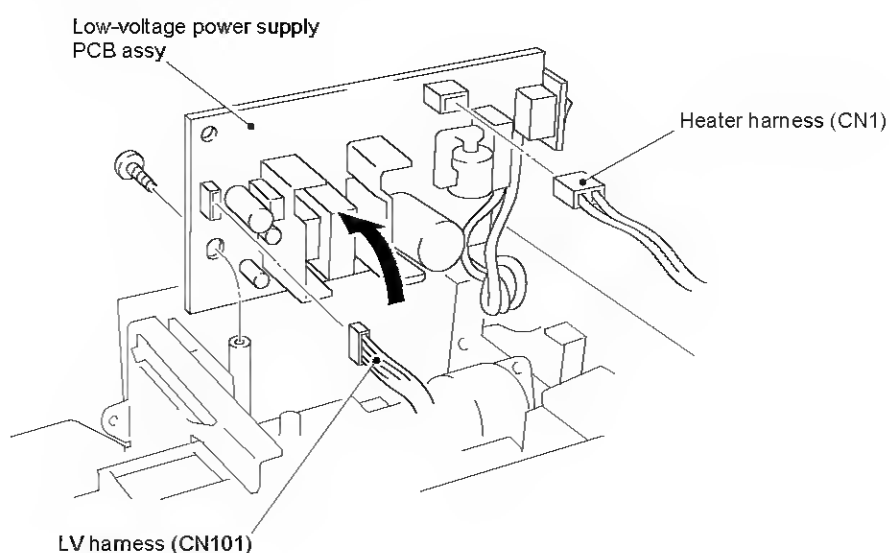


Fig. 3.10

3.10 High-voltage Power Supply PCB Assy

- (1) Remove the screw securing the high-voltage power supply PCB assy.
- (2) Disconnect the four connectors from the PCB.

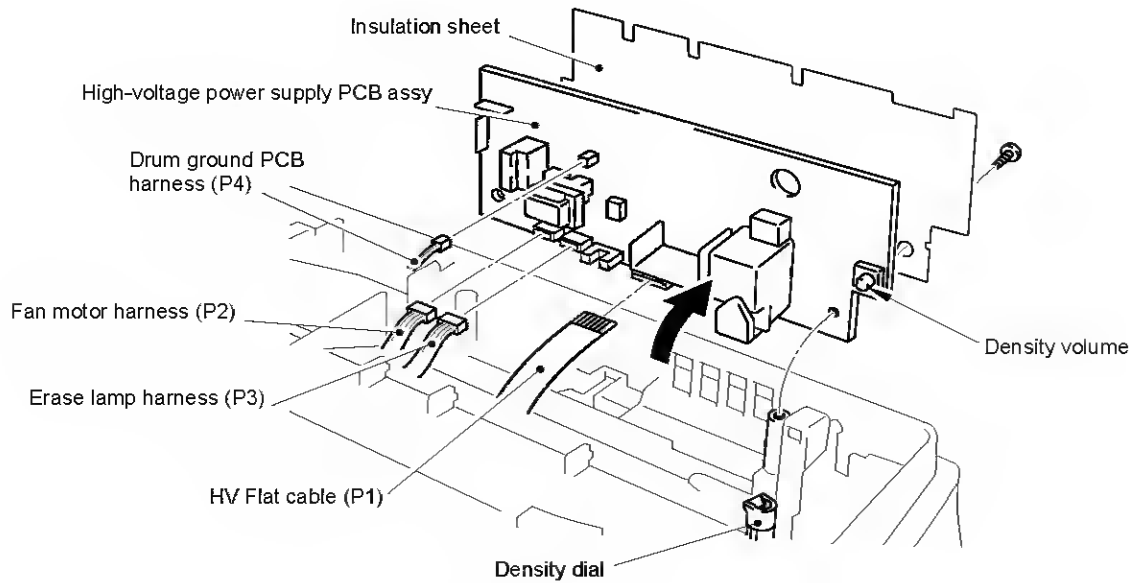


Fig. 3.11

NOTE: When reassembling, the density volume must be fitted into the cut side of the density dial.

3.11 Fan Motor

- (1) Disconnect the connector from the high-voltage power supply PCB. (It has been disconnected already. See above)
- (2) Take off the fan motor assy.

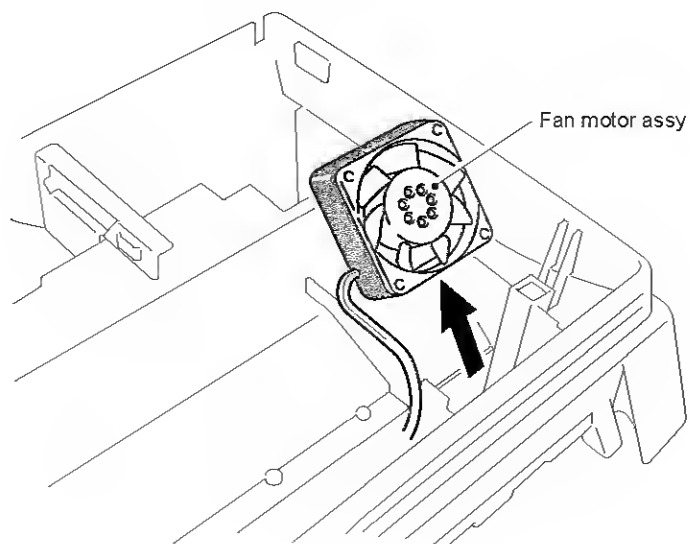


Fig. 3.12

3.12 Drive Unit

- (1) Remove the four screws securing the drive unit.

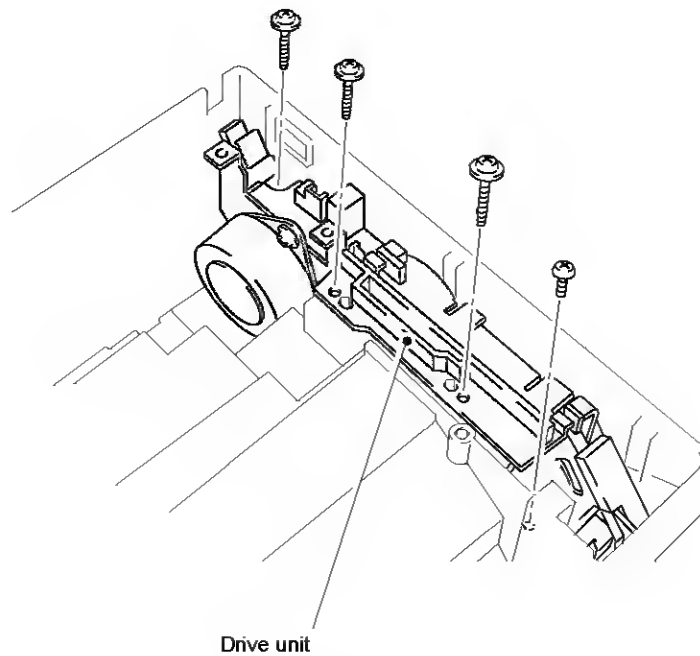


Fig. 3.13

3.13 Main Motor Assy and Motor Heat Sink

- (1) Remove the two screws securing the main motor assy.
- (2) Remove the two screws securing the motor heat sink.

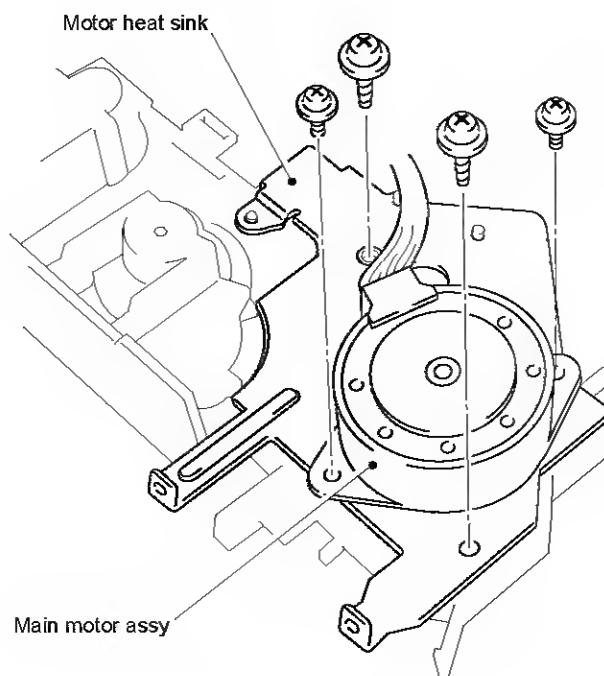


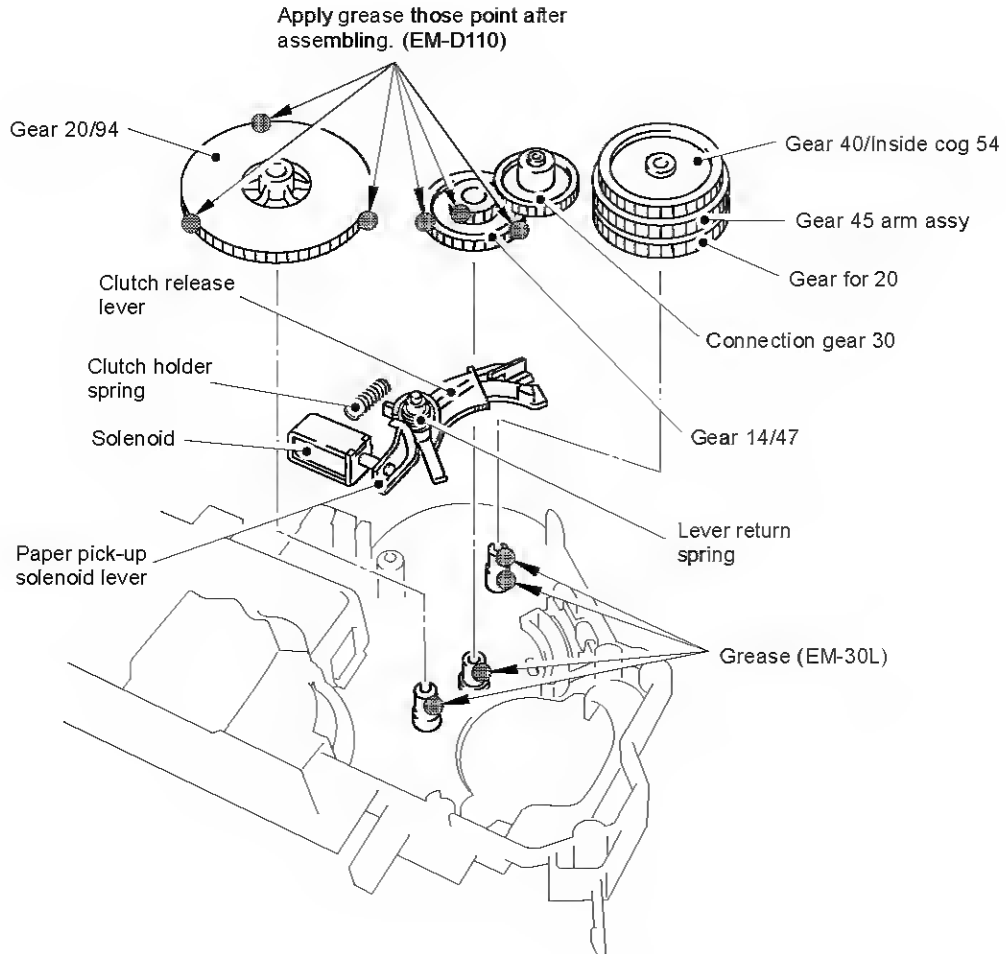
Fig. 3.14

3.14 Gears and Solenoid

(1) Apply grease the point as shown below.

Grease: MOLYKOTE EM-30L TKC-0

MOLYKOTE EM-D110



NOTE: Apply EM-30L to the small gears (2 pcs.) inside "Gear 45 arm assy".

Fig. 3.15

3.15 Tray Extension

- (1) Put the tray extension assy down toward the front of the printer, and pull the bottom of its both side legs outward to release it.

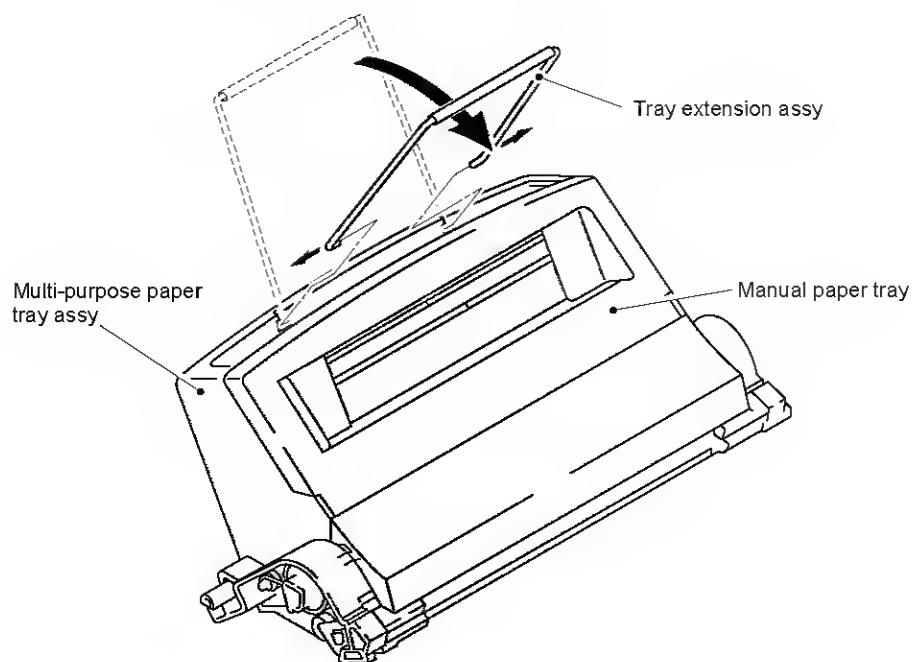


Fig. 3.16

3.16 Paper Eject Tray Assy

- (1) Open the paper eject tray.
- (2) Press the both sides of hinges of the paper eject tray inward to release it from the holes on the top cover.
- (3) Press the tray extension toward the arraies and remove it.

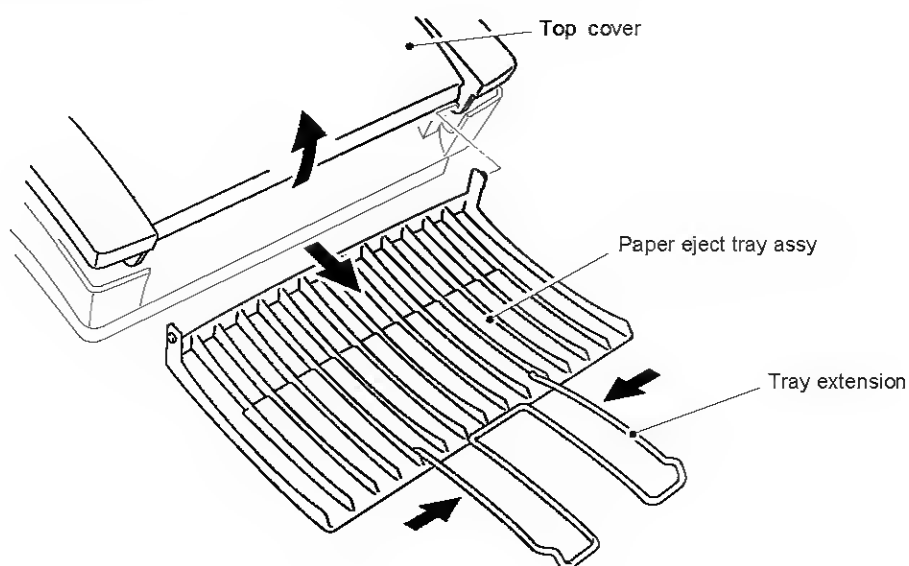


Fig. 3.17

3.17 Core

- (1) Remove the flat cable from the ferrite core secured to the LD harness on the back of the scanner unit, and then cut the binder with tool like a scissors to remove the ferrite core secured to the LD harness.

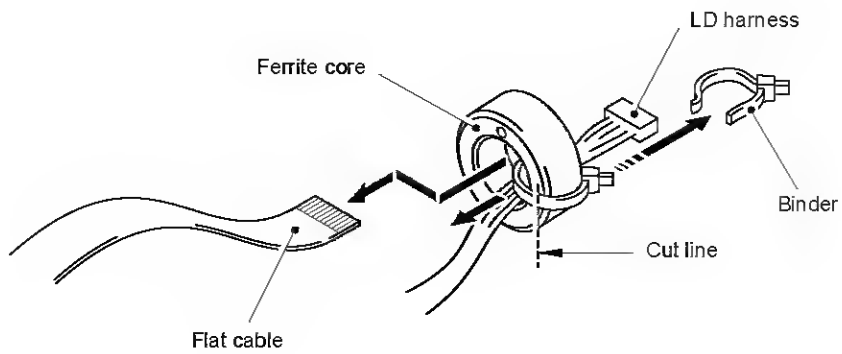


Fig. 3.18

- (2) Cut the binder with tool like a scissors to remove the core secured to the body bottom. And then remove the motor harness, the solenoid and the drum ground PCB assy which are through the core.

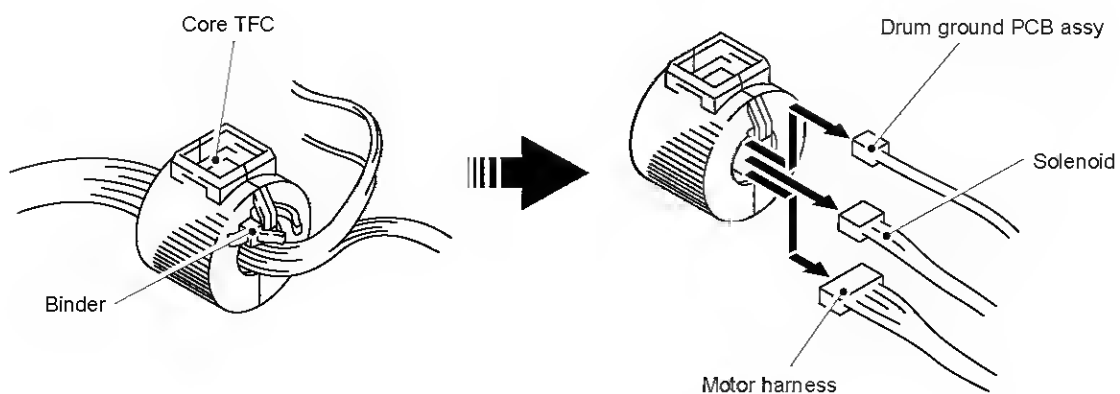


Fig. 3.19

4. PACKING

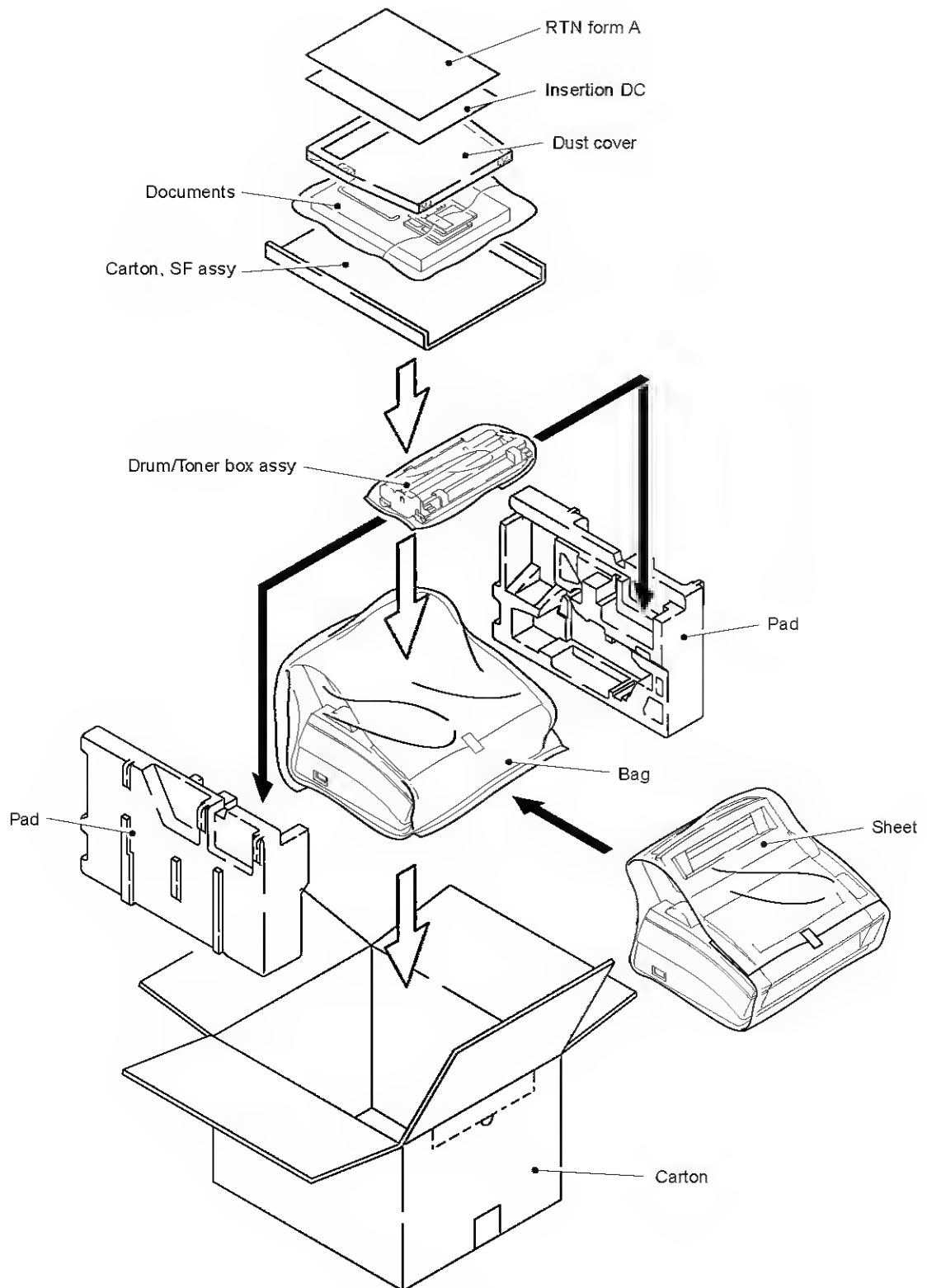


Fig. 3.20

CHAPTER IV TROUBLESHOOTING

1. INSPECTION MODE

1.1 Incorporated Inspection Modes

The printer incorporates the inspection modes such as the factory inspection mode and the test print mode. The inspection mode varies with the model of the printer.

Factory inspection mode, Continuous grid pattern print mode, 3 patterns print mode and NV-RAM value dump mode etc.

The operation of the inspection mode is as follows.

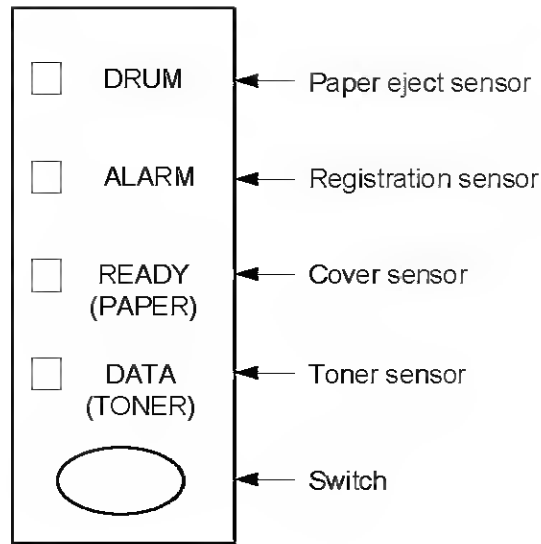
- (1) Turn off the power of the printer.
- (2) With the top cover open, turn on the power while holding down the button of the operation panel.

When entering this setting, DRUM LED is ON. While holding down the button, LEDs go ON in the order of DRUM -> ALARM -> READY -> DATA -> DRUM. If you release the button, a mode is selected. The mode selected is indicated by the LED which is ON when you release the button. The inspection modes are assigned to the respective LEDs as shown below.

LED	Type of inspection
DRUM	Factory inspection mode
ALARM	Continuous grid pattern print mode
READY	3 patterns print mode (grid horizontal lines and black)
DATA	NV- RAM value dump mode
DRUM+ALARM	The ROM code update (only when flash memory is mounted)
ALARM+READY	RAM check
READY+DATA	4% density printing

Details of the factory inspection mode are as follows.

This mode is used to check if the sensors in the printer function correctly. On the process of this inspection, LEDs and buttons are also checked. On entering this mode, the LEDs show the status of respective sensors as follows.



Paper eject sensor	ON (Paper is detected.)	DRUM LED ON
	OFF (No paper is detected.)	DRUM LED OFF
Registration sensor	ON (Paper is detected.)	ALARM LED ON
	OFF (No paper is detected.)	ALARM LED OFF
Cover sensor	ON (The top cover is closed.)	READY LED OFF
	OFF (The top cover is open.)	READY LED ON
Toner sensor	ON (The toner cartridge is installed.)	DATA LED OFF
	OFF (No toner cartridge is installed.)	DATA LED ON

The procedure for the factory inspection mode is as follows.

- (1) Open the top cover and remove the drum unit.
- (2) Turn on the power of the printer while holding down the button. DRUM LED goes ON.
- (3) Lightly press the button again.
- (4) Check if DRUM (paper eject sensor) and ALARM (registration sensor) go OFF after all the LEDs go ON.
 If the paper eject sensor is ON at this point, DRUM LED goes ON (error).
 If the registration sensor is ON at this point, ALARM LED goes ON (error).
- (5) Install the drum unit.
 Check if the DATA LED goes OFF.
- (6) Lightly touch the registration sensor actuator.
 Check if the ALARM LED goes ON.
- (7) Close the top cover.
 Check if the READY LED goes OFF.
- (8) Press the button.
- (9) If all the sensors are correct, the printer goes back to the READY status. If any error is detected, the corresponding LED stays ON.

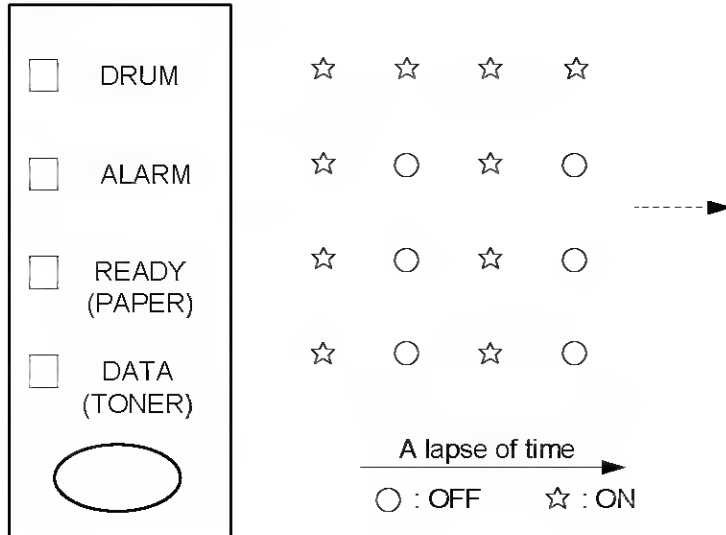
1.2 Error codes

In the event of a printer failure, error codes will be indicated as shown below. All the LEDs and the specific LEDs go ON by turns repeatedly. The specific combination of ONs indicates the type of the error.

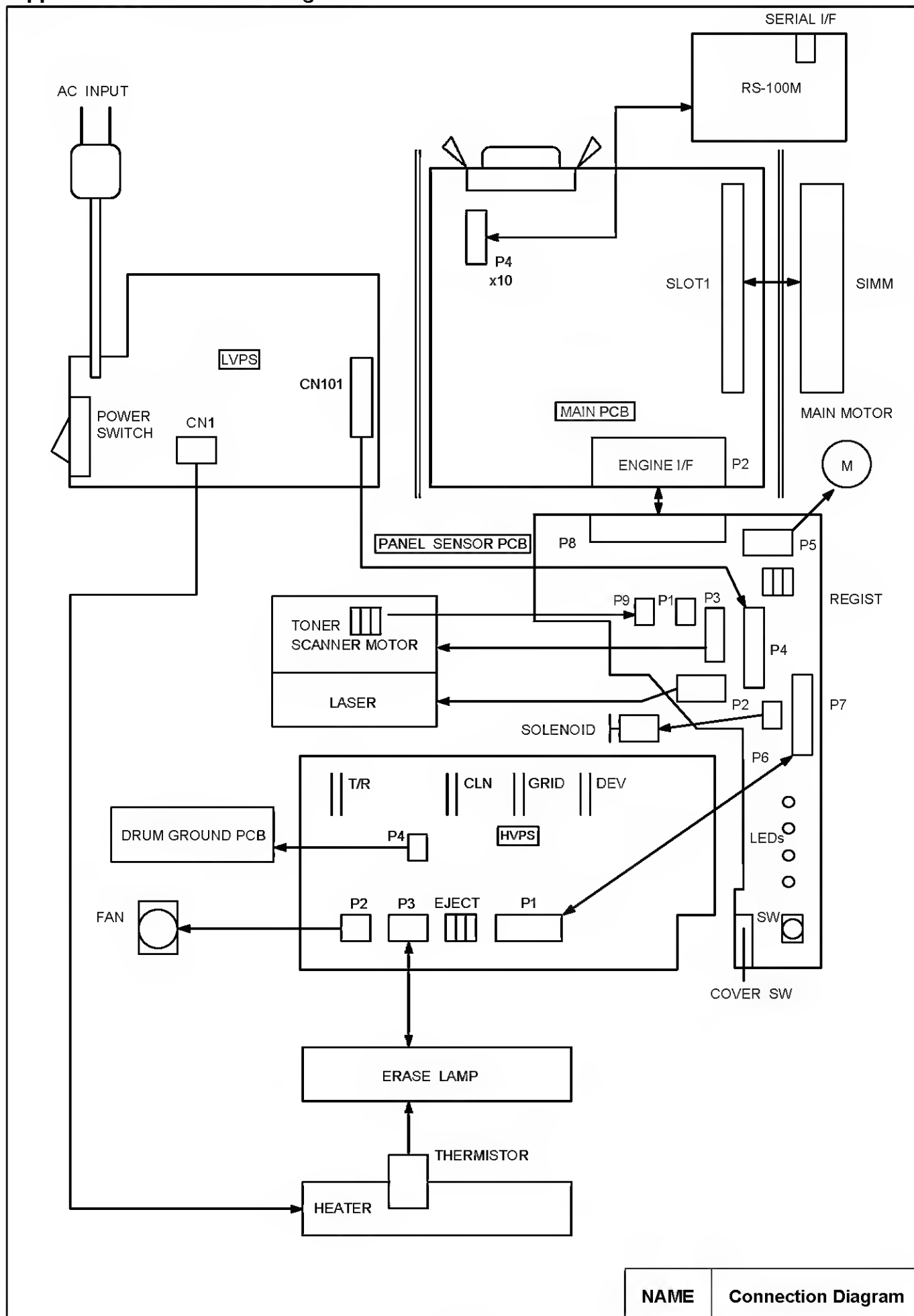
Type of error	DATA	READY	ALARM	DRUM
Fuser Malfunction				○
Laser BD Malfunction			○	
Scanner Malfunction			○	○
ROM Error		○		
D-RAM Error		○		○
Service A		○	○	
Service B		○	○	○
NV-RAM Error	○	○		○
CPU Runtime Error	○	○	○	○

LED INDICATING THE ERROR

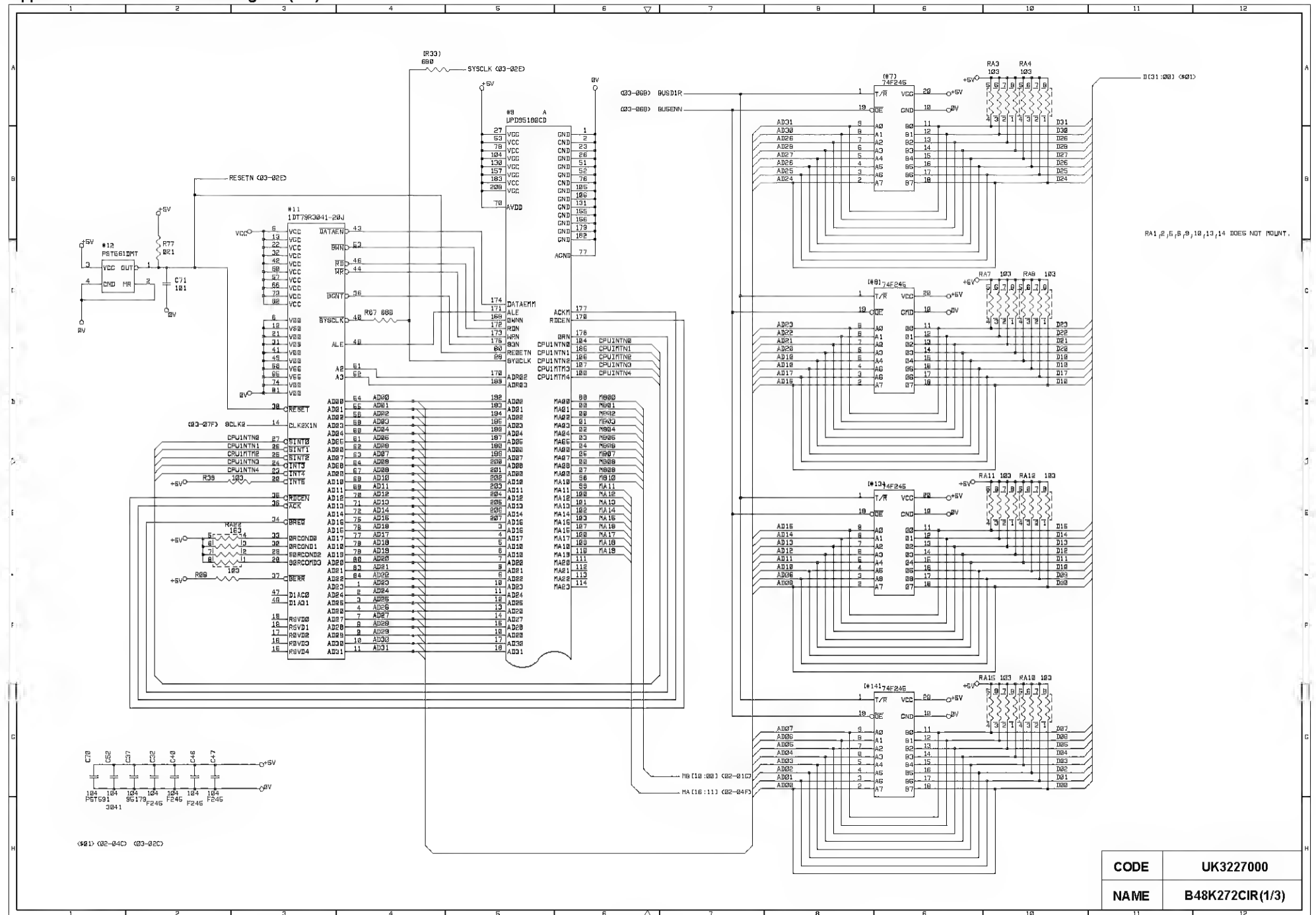
FUSER MALFUNCTION



Appendix 1. Connection Diagram



Appendix 2. Main PCB Circuit Diagram (1/3)



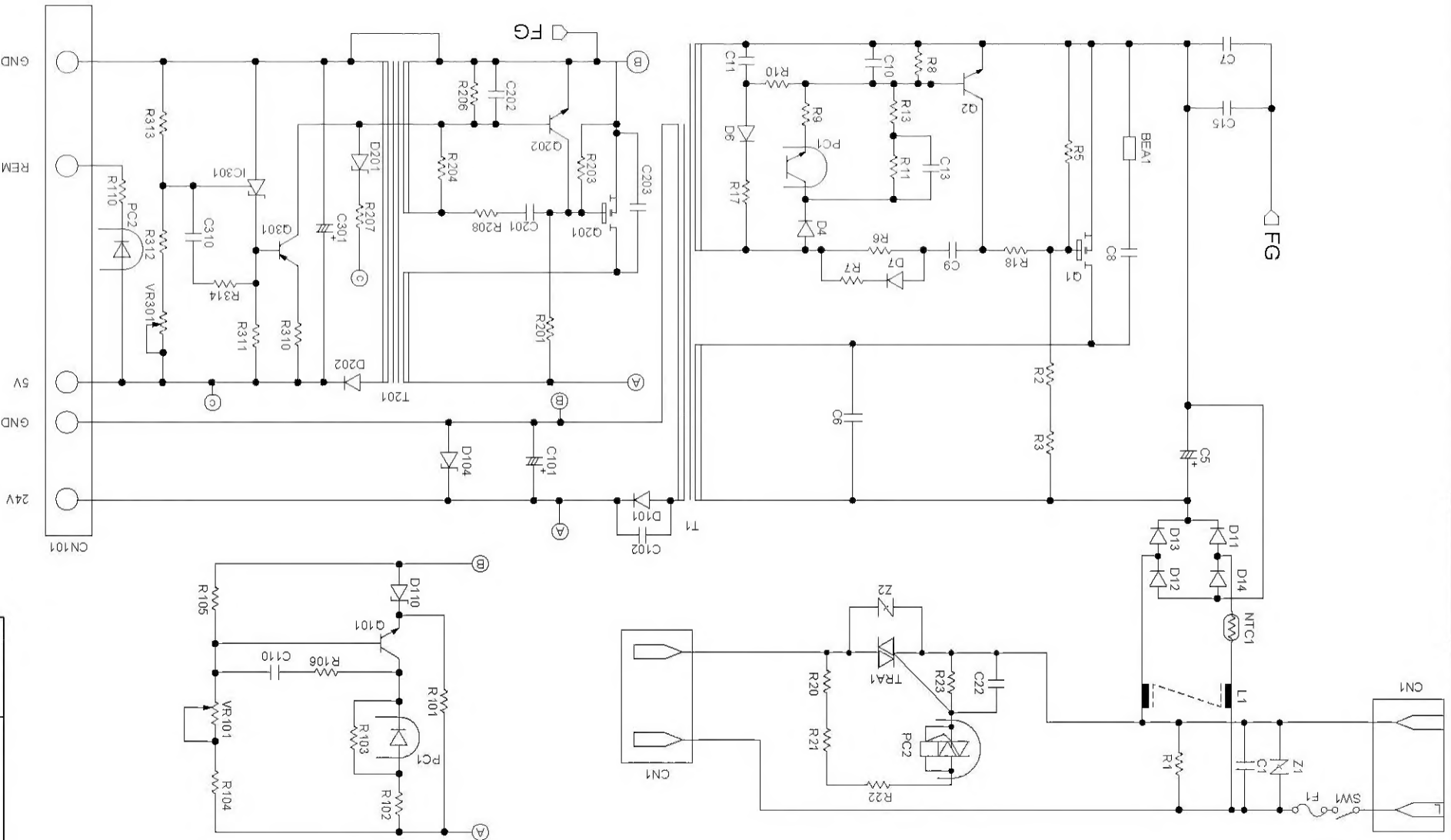
CODE	UK3227000
NAME	B48K272CIR(1/3)

The diagram is a detailed electronic circuit for the B48K272CIR (3/3) microcontroller. It features a power supply section with a 5V regulator, a clock section with a 4.096MHz oscillator, and a data bus section with multiple 8-bit and 16-bit data lines. The diagram is labeled with various component values and pin numbers, and includes a legend for component codes.

Legend:

CODE	NAME
UK3227000	B48K272CIR (3/3)

Appendix 6. Low-Voltage Power Supply PCB Circuit Diagram 230V



NAME	Low-Voltage PS Circuit 230V
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